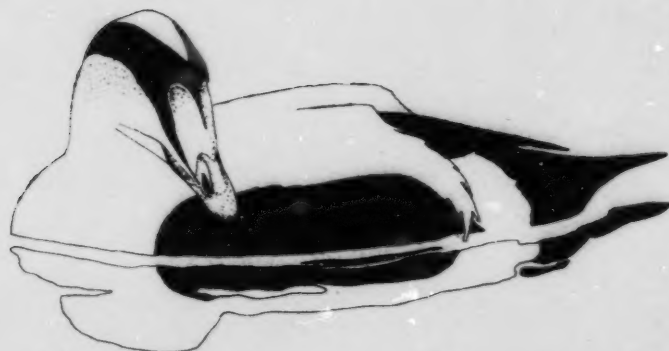


SEABIRD AND SEADUCK MOVEMENT THROUGH THE NORTHUMBERLAND STRAIT, 1990

C. M. MacKinnon
R. W. Daury
R. J. Hicks



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ABSTRACT

In 1990, 22 hours of observation, spread equally over 22 days between March 13 to May 15 and September 7 to December 6 recorded 5,214 (237 birds/hour) seaducks and seabirds moving past the headland of Cape Jourimain and through the Northumberland Strait. A total of 25 bird species were enumerated in the spring, being predominantly Red-breasted Merganser (*Mergus serrator*), Surf Scoter (*Melanitta perspicillata*), Herring Gull (*Larus argentatus*), Black Scoter (*Melanitta nigra*), Canada Goose (*Branta canadensis*), Great Black-backed Gull (*Larus marinus*), Northern Gannet (*Sula bassanus*), Oldsquaw (*Clangula hyemalis*) and Common Eider (*Somateria mollissima*). In the autumn, movement was slightly different, being predominantly Common Eider, Red-breasted Merganser, Surf Scoter, Double-crested Cormorant (*Phalacrocorax auritus*), unidentified loons, Oldsquaw, Northern Gannet, Herring Gull, Red-throated Loon (*Gavia stellata*), Black Scoter, White-winged Scoter (*Melanitta fusca*) and unidentified terns.

Peak spring movements were on April 6 with 347 birds per hour while peak fall movement was 609 birds per hour on October 30. Directional movement in the spring was not well defined with relatively the same degree of overall movement both north and south. Fall movement was more obviously a southward migration by nearly all species with the peak southward movement on October 23.

Additional supporting information from regional authorities was gathered for certain species such as the scoters, Common Eider, Common Loon, Red-necked Grebe and Northern Gannet. For these species our understanding of their movements, in a regional context, has been enhanced.

RÉSUMÉ

En 1990, 22 heures d'observation réparties également sur 22 jours s'étendant du 13 mars au 15 mai et du 7 septembre au 6 décembre ont permis de recenser 5,214 canards et oiseaux de mer (237 oiseaux par heure) dans le détroit de Northumberland. En tout, 25 espèces d'oiseaux ont été recensées au printemps; les espèces prédominantes étaient le Bec-scie à poitrine rousse (*Mergus serrator*), la Macreuse à front blanc (*Melanitta perspicillata*), le Goéland argenté (*Larus argentatus*), la Macreuse à bec jaune (*Melanitta nigra*), le bernache du Canada (*Branta canadensis*), le Goéland à manteau noir (*Larus marinus*), le Fou de Bassan (*Sula bassanus*), le Canard kakawaki (*Clangula hyemalis*), et l'Eider à duvet (*Somateria mollissima*). À l'automne, les mouvements étaient quelque peu différents; dominaient alors l'Eider à duvet, le Bec-scie à poitrine rousse, la Macreuse à front blanc, le Cormoran à aigrettes (*Phalacrocorax auritus*), des huard non identifiés, le Canard kakawi, le Fou de Bassan, le Goéland argenté, le Huard à gorge rousse (*Gavia stellata*), la Macreuse à bec jaune, la Macreuse à ailes blanches (*Melanitta fusca*) et des sternes non identifiées.

L'apogée des mouvements printaniers s'est produite le 6 avril où l'on a vu 347 oiseaux l'heure, tandis que l'apogée des mouvements de l'automne s'est produite le 30 octobre où l'on a recensé 609 oiseaux par heure. Au printemps, les mouvements dans une direction donné n'étaient pas bien définis puisque l'on noté dans l'ensemble autant de mouvements vers le nord que vers le sud. En automne, il s'agissait plus évidemment d'une migration vers le sud pour presque toutes les espèces, migration qui a atteint son apogée le 23 octobre.

Les autorités régionales ont fourni d'autres renseignements supplémentaires sur certaines espèces comme la macreuse, l'Eider à duvet, le Huard à collier, le Grèbe jougris et le Fou de Bassan. Nos connaissances sur les déplacements de ces espèces dans nos régions ont été ainsi accrues.

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Without the diligent observations and note keeping of naturalists in the area, such as Dave Christie, Stu Tingley, Captain Holdway, and Reid MacManus, many pieces of the puzzle would still be missing. The endeavours of members of the P.E.I. Natural History Society, N.B. Federation of Naturalists, and N.S. Bird Society, with special thanks to Rosemary Curley and Daryl Guignon, are also appreciated.

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1.0 INTRODUCTION

Cape Jourimain National Wildlife Area (CJNWA) was established in 1979 to conserve and protect important habitat for migratory birds, specifically waterfowl and shorebirds. The National Wildlife Area (NWA) supports a high habitat diversity thus making it especially attractive to a wide diversity of wildlife.

Cape Jourimain is also an area of high geographic importance as it is the most prominent coastal headland in the Northumberland Strait. Furthermore, this headland is the closest point between the mainland and Prince Edward Island (PEI), effectively constricting the Northumberland Strait from an average width of about 30 km to 14.5 km across.

The strategic importance of the Cape Jourimain headland also has been evident to developers. As far back as 1900, the site has been identified as the most logical location to build a connection, "fixed link", between New Brunswick (NB) and PEI. The first such "link" was initiated in 1966 when a road and railway bed was built from highway #16 out to Jourimain Island. This road/rail bed, known locally as the "causeway", created two large brackish ponds out of what was once intertidal saltmarsh and irrevocably changed the character of the area.

The mid 1960s attempt for a fixed link between NB and PEI was not to be and construction was halted before work on the actual over-water structure commenced. The mid 1980s has resulted in a renewed interest to build a fixed link and it may become a reality. The tentative plan is to use the old road bed, built in 1966, as

the new approach for the proposed bridge between NB and PEI. If the link is built according to this plan the NWA will be bisected by a major highway along the present Department of Public Works right-of-way.

To provide pre-disturbance baseline data regarding the NWA, an intensive field investigation was conducted in 1989 to document the flora and avifaunal use of the area (Harries et al. 1991, MacKinnon and Hicks 1991a, respectively). As little was known regarding seabird and seaduck movement through the Northumberland Strait, monitoring of this activity was also initiated on a small scale. Results, although preliminary, were encouraging and this aspect of the study was expanded in 1990.

The observations of seaducks and seabirds moving through the Northumberland Strait, as observed from CJNWA, should be viewed as a small part of a much larger story. In this report we have drawn on many authorities in an attempt to fill in the "stories", where possible, surrounding each species. We have not commented on the possible effects or mitigable measures regarding a fixed link; our focus has been solely on the birds.

Considering the volume of data collected, and the myriad of possible sources of additional information, we have attempted to be thorough without being redundant. This was not always possible and, where it happens, we apologize.

2.0 STUDY AREA

Cape Jourimain National Wildlife Area borders on the Northumberland Strait at the southeastern extremity of NB (Figure 1). The 600 ha (1500 acre) coastal site was established in 1979 following the transfer of 205 ha from the Federal Department of Public Works in 1977 and the purchase of additional properties in 1979.

The Cape Jourimain headland extends seaward 2.5 km northeast of the Cape Tormentine peninsula and at its extremity is only 14.5 km from PEI. The Northumberland Strait is a crescent shaped body of water separating mainland NB and Nova Scotia (NS), from PEI. The strait extends some 285 km, roughly, from Point Escuminac, NB, in the north to Cape George, Antigonish Co., NS, to the south and east (Figure 1). The coastline of the strait is undulating, resulting in a number of productive, shallow-water bays. This varied coastline also results in extremes in the width of the Northumberland Strait which usually varies from 20 to 40 km across.

The Northumberland Strait connects with the Gulf of St. Lawrence to the north and to the southeast. The effect of the topography is that any birds flying through the Northumberland Strait must pass the constriction between Borden, PEI, and the Cape Jourimain headland, NB. This is not only the best location in the Strait to observe bird movement, but also is the proposed site for the fixed link connecting PEI to the mainland.

The ice regime within the strait follows an annual, although

not always predictable, cycle. Ice build up in the strait, off CJNWA, is usually substantial by early January. Between January and early March, wind action has a significant effect on the large ice pans and, when combined with tides, can result in extensive build up along the shore. During the most severe winter months there are relatively few open leads in the strait and essentially no winter habitat for birds.

During late March and April the pan ice begins to break up, especially along the eastern portions of the strait, however, it is at this same time that pack-ice begins to enter from the north. In early April the center of the strait is usually open, although not necessarily ice free, while the coastal bays to the north of CJNWA are often still iced-in. By late April-early May the area is relatively ice-free.

3.0 METHODS

Occasional seaduck and seabird watches by CWS staff in 1989 and work by P. Lane and Associates Ltd. (1989) provided some insight into the possible magnitude of bird movement through the Northumberland Strait. From this preliminary work a more complete series of surveys was conducted in 1990. Observations were conducted from the end of the road at the Cape Jourimain headland, weekly from March 13 to May 15 and from September 7 to December 6, 1990. The daily duration of each survey was one hour, this was

divided into six 10 minute observation blocks as in Brown et. al. (1975). Each daily observation was usually conducted between 08:00 and 11:00 hours.

One and sometimes two observers conducted the surveys. Observer(s) were equipped with 7x35 binoculars and 15-60x spotting scope. Effort was made to choose clear days for the weekly observations to maximize visibility. All bird movement was recorded by species (or genera) and the numbers observed, time and direction of flight was recorded. There were four "movement" categories; "NORTH" birds flying to the northwest ; "SOUTH" birds flying to the southeast; "ACROSS" birds flying to or from PEI, and "WATER" birds resting on the water immediately in front of the cape.

Observation conditions were usually extremely good and birds could be identified and enumerated at considerable distances. Obviously not all birds were seen; therefore the numbers recorded here are conservative.

When precise species identification was not possible, birds were classified to the next taxonomic level (e.g. scoters, gulls, loons). Data were separated by species or genera, and only the full hourly observations were summarized. The separate 10-minute blocks were not analyzed individually owing to insufficient or erratic sample size for most species at that level. Should readers be interested in the block observations and times, the raw data have been presented in Appendix 1.

Summarized data, by species, were distributed to regional

authorities (see acknowledgements) and compared to the existing literature to evaluate its significance.

Throughout this report, data have been presented in birds/hour. It should be emphasized that these values represent 1 hour of observation per survey date and do not express day averages or peak movement.

4.0 RESULTS AND DISCUSSION

4.1.a Preliminary seaduck and seabird observations, 1989

Preliminary observations from Cape Jourimain were conducted for six one-hour, sessions in April, May, and September 1989 (Table 1). The direction of flight was not recorded for the observations conducted in May. Seventeen species were noted utilizing the Northumberland Strait during these preliminary observations.

The largest number of birds observed in the spring was 135 birds/hour on May 2, 1989, and Great Black-backed Gull comprised 56% of these observations. In the autumn, 127 birds/hour were observed off the cape area on September 26, 1989. Approximately 56% of the birds recorded on this day were Black Scoter.

These observations demonstrated that further monitoring of seabird and seaduck movement through the Northumberland Strait was warranted.

4.1.1.b General observations and composition by species, 1989

Twenty-two hours of observation during the months of March to May and September to December of 1990 recorded 5214 birds, representing 25 species, moving through the Northumberland Strait past the CJNWA headland. The peak number of birds recorded in a one-hour observation period in the spring was on April 6 when 347 birds were observed. The largest number of birds observed in the autumn was 609 on October 30.

The timing of a northward migration in the spring appears less defined as compared with the southerly movement observed in the autumn (Figure 2). The southerly movement of birds past Cape Jourimain steadily increased from September 4, peaked October 23, and declined until November 27. In the spring, adverse environmental conditions such as severe weather may halt the northerly progress of these species to the breeding areas. However, in the autumn, migration to the south appears more directed as the birds move to their respective wintering areas.

Fewer birds were observed sitting on the water during the spring than the autumn. Prior to the autumn date when the largest number of birds were observed flying south, there was a substantial proportion of the seabirds sitting on the water or staging near the cape. In the autumn, staging behaviour was more pronounced as the seaducks and seabirds made their way south. Staging activity during the spring was not as evident from our observations as bird movement was nearly equal in both directions.

During the 1990 spring surveys, 18 avian species were identified. Red-breasted Merganser sightings comprised the largest percentage (23%) of observations (Figure 3). The three species of scoter accounted for 35% of the records. Surf Scoter represented 19% of the scoters, scoters of an unknown species 9%, Black Scoters 7%, and White-winged Scoters <1%. Herring Gulls, comprised 9% of the sightings, Canada Geese 6%, Great Black-backed Gulls 6%, Northern Gannets 4% and Oldsquaws 4%. Brant (*Branta bernicla*) and Iceland Gulls (*Larus glaucoides*), were incidental species.

During the autumn, 20 avian species were identified off Cape Jourimain. Common Eiders comprised 16% of the bird sightings in the autumn and 64% of these were observed sitting on the water near Gunners Point (Figure 1). All scoter species, including those not identified to species, represented 25% of the sightings (Figure 4). Surf Scoters were noted in 11% of the scoter sightings, unknown scoter species 8%, Black and White-winged Scoters each 3%. Red-breasted Mergansers, Double-crested Cormorants, unidentified species of loon, and Oldsquaws made up 16%, 10%, 7%, and 5%, respectively, of the total observations during the autumn. Some species, however, were observed sporadically, such as Bonaparte's Gull (*Larus philadelphia*), Great Blue Heron (*Ardea herodias*) and Northern Pintail (*Anas acuta*). To our knowledge the data obtained for these species did not reflect any pattern of movement through the strait.

4.2.1 Loons (all species)

Thirty percent of the 342 loons observed were identified as Red-throated Loon (Figure 5). Red-throated Loon was the only species identified as they often rafted close to the cape (Tables 2 and 3). Common Loon (*Gavia immer*) was expected to be present (Table 2), but the identification to species was difficult from long distances.

Of all the loons observed, a maximum of 190 birds/hour were flying south on October 30. Prior to this date, between 40 and 50 were sitting on the water in late September and early October. Godfrey (1986) noted that both Red-throated and Common Loons winter off the Atlantic coast. The Common Loon also breeds in the Maritimes.

4.2.2 Red-throated Loon

Red-throated Loons comprised most of the loons (92%) sitting on the water near the observation point (Figure 6). Many Red-throated Loons were also sighted in the area during avifaunal surveys in mid-November from 1973-1988 (Table 2). Records extracted from the NB Naturalist (NBN) (Table 5), NS Bird Society (NSB) (Table 6) and the PEI Natural History Society (PEINHs) (Table 4) indicate substantial fall numbers of Red-throated Loon in the strait between October and November with a maximum of 410 off CJNWA

on October 23, 1986 reported by the NBN (Table 5). Spring Red-throated Loon sightings along the strait are lacking with the exception of one noteworthy flock of 200 on April 28, 1972 well to the north at Dalhousie, NB (Table 5). Christmas bird counts, however, reported far fewer Red-throated Loons in the Cape Tormentine area in late December (Table 3). As small numbers of Red-throated Loons winter in the coastal waters off NS (MacKinnon and Hicks, 1991a) (Tufts 1962), as well as further south, it is possible that this species stages in the Northumberland Strait in the fall prior to moving to their wintering areas. Fall bird reports from the PEI Natural History Society (PEINHS) also support continued use by Red-throated Loons of the Northumberland Strait during the past 30 years (Table 4).

4.2.3 Common Loon

Common Loon was not identified during the surveys. However, supporting documents suggest that a number of the loons not identified to species were probably Common Loons. Mid-November surveys of the Cape Jourimain area by the Chignecto Naturalists Club and the Christmas bird count (Tables 2 and 3) indicate small number of Common Loons around the CJNWA.

A.D. Smith (pers. comm.) reported that large numbers of non-breeding Common Loons annually spend the summer in Baie Verte (a maximum of 136 on July 4, 1980). According to A.J. Erskine (pers.

comm.) other shallow water bays along the Northumberland Strait also contain summering Common Loons, however, these numbers are less than at Baie Verte. Of 34 records between 1960 and 1990, Erskine's largest reported flock outside of Baie Verte was 17 immature birds at Merrigomish, Big Is., NS. Additional records from the NSB indicate small numbers, 16-20 at Pictou and 10-45 at Tidnish centered around September and October (Table 6). The extent of use of the Northumberland Strait by Common Loons is largely unknown, but data suggests it may be substantial, and that it is an extremely important summering area for juvenile birds. Many juveniles from the Northeastern United States and Atlantic Canada may summer in the Northumberland Strait, but the importance of the shallow coastal bays is largely unknown.

4.3 Horned Grebe (*Podiceps auritus*)

There were no Horned Grebe sightings during the 1990 observations from Cape Jourimain. Although this species mostly breeds north and west of the Great Lakes (Godfrey 1986), there are small numbers that nest in the Gulf of St. Lawrence and sporadically in other locations in the Atlantic region. Mid-November surveys conducted at CJNWA document annual use by Horned Grebes during the past 15 years (a maximum of 24, on November 25, 1979, Table 2) and a few individuals ($N = 5$) sighted during the Christmas bird counts from 1960 until the present (Table 3).

Recent surveys indicate small numbers of wintering Horned Grebes off the coast of southwestern NS (MacKinnon and Hicks 1991a).

4.4 Red-necked Grebes (*Podiceps grisegena*)

The Red-necked Grebe, like the Horned Grebe, breeds almost exclusively north and west of the Great Lakes (Godfrey 1986). Although the Red-necked Grebe is commonly sighted on the mid-November surveys for Cape Jourimain NWA (Table 2) we did not observe any during our surveys. We suspect, however, that the Northumberland Strait may be an important moulting area for the Red-necked Grebe. During an oil spill from the tanker "Golden Robin" in Chaleur Bay, NB, on September 30, 1974, 26 oiled Red-necked Grebes were washed ashore (Smith 1975). Most birds were adults and undergoing full wing moult. A.D. Smith (pers. comm.) believes that the Red-necked Grebe may swim southward through the strait during this molt. Supportive of this are numerous sightings of Red-necked Grebes to the southwest of CJNWA, off Tidnish, NS, between september and December. A maximum of 225 birds were reported by S. Tingley on October 10, 1986 (Table 6). Birds flying to areas outside their normal breeding range, to molt, is a relatively common occurrence and this is believed to be what is happening with the Red-necked Grebe.

4.5 Northern Gannet

One hundred and eighty-three Northern Gannets were observed during the 22 hours of observation (Figure 7). Northern Gannet movements through the strait observed from CJNWA during 1990 were largely unidirectional, moving south both in the spring (55 birds/hour, April 16) and the autumn (61 birds/hour, October 30). The southward movement of Northern Gannets into the Northumberland Strait, observed on April 16, may have been adults (breeders) and juveniles (non-breeders) foraging. Brown et. al. (1975) reported that by May, most birds were observed either to the north of PEI or southward, east of Cape Breton. Supportive of this was an observation of over 1000 Northern Gannets off Miscou Island, NB by the "Chaisson's" on May 25, 1975 (Table 5). It is plausible that gannets enter the Gulf of St. Lawrence throughout April and then enter the strait from the north as ice cover diminishes. Few birds have been sighted during the mid-November surveys (Table 2). On the Cape Tormentine Christmas bird count, only nine individuals were sighted during two of the 30 years that counts were made (Table 3). However, at this time the strait can begin to ice in and observation is difficult. Reports of Northern Gannets from PEINHS are abundant but low in number (Table 4). Detailed observations by Captain E. Holdway (date unknown), of the Wood Island-Caribou ferry provides a source of numbers and timing of movement by Northern Gannet through the strait from 1956-1965. His maximum number of gannet sightings was 755 throughout October.

During no other month from 1956-1965 were this many Northern Gannets observed from the ferry.

Three important colonies in the Gulf of St. Lawrence (Anticosti, Bonaventure, and Bird Rock in Madeleine Islands) are located relatively near the Northumberland Strait (Brown et al. 1975). Brown (1986) also reported on the pelagic distribution of the Northern Gannet in the Gulf of St. Lawrence. It is likely that migration from these colonies partly occurs through the strait. Occasional summer observations (225 off Kouchibouguac Park on July 13, 1973, Table 5) indicate that the productive waters of the strait may also serve as important feeding habitat. R.G.B. Brown (pers. comm.) believes the data (Figure 7) suggests that movements by Northern Gannet through the strait occur suddenly, as a "wave", and does not build gradually.

4.6 Double-crested Cormorant

Identification to species was often difficult when observing offshore cormorants. Although nesting colonies of Great Cormorants (*Phalacrocorax carbo*) exist on northern PEI (Cape Tryon), and in the eastern part of the strait (C.W.S. colonial nesting bird registry). Great Cormorants were not observed on the watches.

Double-crested Cormorant usually arrived around PEI in late April or early May (Table 4). This corresponds with the timing of our first spring sightings. Colonies of Double-crested Cormorant

are numerous in the Maritimes and observations of these birds in the strait is a common occurrence. Three hundred twenty-one individuals were observed from CJNWA during the 1990 observations (Figure 8). Very few were sighted during the spring (a maximum of 8 birds/hour); however, staging and movement in the strait increased during the fall months. At this time a maximum of 113 birds/hour were observed travelling north (September 11) and from 18-80 were observed sitting on the water near Cape Jourimain (September 11 - October 12). Staging of cormorants likely occurs along the total length of the Northumberland Strait as the birds migrate toward wintering areas. Cormorant colonies, relatively close to the strait (eg. Courtin and Ram Island, Malpeque Bay, PEI numbering 3 to 5 thousand pairs) may account for some of the migrants observed in the autumn.

Mid-November surveys of CJNWA often recorded Great and Double-crested Cormorant in the area (Table 2). Sightings of these two species during Christmas bird counts at Cape Tormentine were limited to 1-6 individuals of either species per year in the late 1970s and early 1980s (Table 3).

4.7 Canada Goose

Although more than 200 Canada Geese were observed near Cape Jourimain during the observation periods, most (95%) birds were moving across the strait either to or from PEI (Appendix 1). As

well, substantial numbers of Canada Geese were observed from Cape Jourimain during the mid-November avifaunal surveys (Table 3). Although our data on Canada Goose movement across the strait is limited, we know that at some times it must be substantial. Aerial surveys conducted in the fall for Canada Geese on PEI regularly record 15 to 26 thousand birds (MacKinnon 1989). Many of these birds utilize the bays and inlets located along southern PEI and coastal NB and NS. Hence, the strait may not be an important migration route for Canada Geese flying through this body of water as it is to other seabirds. However, the many productive bays are very important for migrating Canada Geese and large numbers must cross at key times of the year.

Christmas bird counts in the Cape Tormentine area have documented between 0 and 1373 Canada Geese (Table 3). Variation in ice cover undoubtedly results in the large fluctuation of geese observed in the annual bird counts.

4.8 Common Eider

Six hundred and forty-one Common Eiders were observed from Cape Jourimain during the study. Very few Common Eiders were observed during the spring and 14% of those were sitting on the water near Gunner's Point. Common Eiders were observed predominantly (92%) during the autumn (Figure 9).

At the beginning of the autumn surveys (September 7), and

continuing on to approximately October 23, numerous Common Eiders were observed staging on the water near the cape. However, two weeks later, almost all of the Common Eiders were observed migrating south past Cape Jourimain.

Overland migration routes travelled by Common Eider between the Bay of Fundy and the Northumberland Strait have been discussed thoroughly by Erskine and Smith (1986). By combining the findings of band returns and the notes of many naturalists (D.S. Christie, K.H. Deichmann, R. McManus, and S.I. Tingley) they have well documented this overland migration of Common Eider. Numerous other observations support this northward migration route. During an eclipse of the sun in April of 1970, 7 Common Eider struck hydro-transmission lines during their overland migration through the Memramcook Valley (C.W.S. unpubl. data). As birds migrate south, they may pass overland along a broad front from Shediac, NB to Wallace, NS. The Chignecto Isthmus, however, is the area where most birds appear to cross overland to the Bay of Fundy.

Our data from observations off Cape Jourimain support these assumptions and indicate that although few birds are observed in the spring, substantial numbers of Common Eiders may pass by Cape Jourimain when moving south in the fall.

Northerly migration overland to the Northumberland Strait from the Bay of Fundy may follow two generalized routes: 1) eiders in the upper Bay of Fundy may stage and progress overland near Cape Enrage and Waterside (D.S. Christie, pers. comm.) (Table 5). They then proceed northeast overland to the head of the Petitcodiac

River and on to Shediac Bay or possibly farther north (see Figure 10, routes A and B for geographical presentation); or 2) by flying further up the Bay of Fundy into Shepody Bay and on to the mouth of the Petitcodiac and then Memramcook River. They then proceed up Memramcook River (Figure 10, route C) and progress northerly overland to the head waters of the Scoudouc River, then northeast towards Shediac Bay (Erskine and Smith 1986). Shediac Bay is approximately 50 km north of Cape Jourimain.

Undoubtedly, some Common Eider migrate along the entire length of the strait in the spring. Flying north from the Gulf of Maine they travel up the eastern shore of NS and through the Strait of Canso or around Cape Breton (or in the fall, vice versa, Figure 10, routes D, F, and G).

In the autumn, Common Eiders move in a southerly direction down the Northumberland Strait, and many pass Cape Tormentine. An overland migration ensues across the lowlands of the Isthmus of Chignecto, from Baie Verte (to the south of Cape Tormentine) overland across the Tintamarre NWA (Jolicure Lakes) and Missiquash marsh and onward to Chignecto Bay (Figure 10, route E). "Visible migration" of Common Eiders across the Isthmus of Chignecto has been documented by a number of people. Most recently, on October 13, 1990, R.J. Hicks observed approximately 500 Common Eiders flying west, low across Jolicure Lake toward the Bay of Fundy. A.D. Smith (pers. comm.) also has observed Common Eider movement overland in the same area and direction noted by Hicks. R. Thompson (pers. comm.) witnessed similar migration of smaller

numbers of Common Eiders crossing the Missiquash marsh in the direction of the Bay of Fundy during the third week of October, 1988. Adverse weather conditions also were noted by both Hicks and Thompson. A.D. Smith (pers. comm.) also collected a Common Eider in weakened condition on Tantramar Marsh during October 9, 1971. Common Eiders also were sighted in the Chignecto Bay and the Head of the Bay of Fundy on surveys of waterfowl during March to May in the late 1960's (Hughson 1972). Eiders may also use the Petitcodiac and Memramcook/Scoudouc River routes when migrating south (Table 5), D. Christie pers. comm.), however, these numbers are substantially less than what is observed in the spring.

Common Eiders were frequently reported in the mid-November surveys (Table 2) and Christmas bird counts at Cape Tormentine (Table 3). Common Eider sightings during Christmas counts, similar to those of Canada Goose, probably depend heavily on environmental conditions. Reports of small numbers of Common Eiders in the strait during spring and summer also were found in the news letters for the Natural History Society of PEI (Table 4).

4.9 Oldsquaw

Two hundred and forty-seven Oldsquaws were noted during the observations (Figure 11). Oldsquaws were not observed until March 26 which roughly corresponded with ice break up in the Northumberland Strait. Initially, many of the birds observed from

Cape Jourimain during the spring were sitting on the water. Then, as time passed, between April 9 and May 10, more Oldsquaws were observed flying north.

During autumn, a large percentage of Oldsquaws were observed flying south with a maximum of 40 birds/hour on October 30 and another peak of 25 birds/hour on November 27. As the birds continued to move south, until the end of the observation period (September 24 - December 6), the overall number of Oldsquaws staging in the area also increased.

Oldsquaws were commonly noted in both the mid-November surveys (Table 2) and the Christmas bird counts at Cape Tormentine (Table 3). They were frequently reported by members of the PEINHS (Table 4) and a substantial flock of 1000 birds was observed on April 9, 1966, off Jacquet River, NB (Table 5). Small numbers inhabit open leads in waters of the Northumberland Strait throughout the winter.

4.10 Scoters (all species)

A total of 1400 scoters were observed from Cape Jourimain during the 1990 surveys. Scoter sightings near Cape Jourimain were minimal until April 6 when 150 birds/hour were observed (Figure 12). Later numbers decreased progressively until a second peak of 114 birds/hour was sighted on May 10. During autumn, the number of scoters sighted per hour steadily increased from initiation of fall surveys, peaked on October 23 with 383 scoters per hour (mostly

Surf Scoter), then declined rapidly to less than 50/hour on November 21. This fall migration southward was amazingly uniform in that observations neatly fit a normal distribution (bell) curve.

Few of the scoters observed in March were identified to species. Initially, White-winged and Surf Scoters were the only species identified. As the number of sightings of Surf Scoters declined, the number of Black and White-winged Scoters increased. During the autumn, all three species were observed during the first survey. The largest number of sightings of Black Scoters was October 12 (18 birds/hour), White-winged Scoters - October 17 (39 birds/hour), and Surf Scoters - October 23 (237 birds/hour). Surf Scoters comprised more than half (237) of the peak number of scoters observed on October 23 (383 birds/hour). The remainder of the scoters observed on October 23 were not identified to species as positive identification can often be difficult.

The ratio of Surf to Black Scoter observed in this study was 5:2 (493:191). Erskine (1987) reported the same ratio for these species in Labrador; extracted from spring surveys. Christie (1980) also reported the ratio of Surf to Black Scoters staging near Fundy National Park (at Waterside) as 5:2 in late April. Having three separate studies report the same population ratios for Surf to Black Scoter is certainly interesting. Christie (1980), however, did not comment on the ratio of either of these species to that of White-winged Scoter. Erskine (1987) reported that the ratio of Black Scoter to White-winged Scoter as 5:2 for the fall

harvest of the Atlantic provinces. Our study found the Surf to White-winged Scoter ratio to be approximately 5:1.5 (493:140).

During our spring observations, the ratio of Surf to Black Scoter was approximately 3:2 and the ratio of Surf to White-winged Scoter was 3:1. The ratio of scoters observed during the autumn were marginally different from those observed in the spring. The Surf to Black Scoter ratio was approximately 4:1, and Surf to White-winged approximately 3.5:1. Roughly equal numbers of Black and White-winged Scoter were observed during this time.

Little has been documented regarding route(s) of scoter migration in relation to the Northumberland Strait, however, numerous observation records exist (Tables 4 to 6). It appears that, in the spring, scoters probably migrate in a manner similar to Common Eider, however, in fall they follow a separate route. Observations of scoters passing Cape Jourimain during spring are far more abundant than those for Common Eider. Also, spring scoter movement (of all species) was not in any single direction. Between March and May 53% were flying north, 39% flew south and still others (9%) were sitting on the water (staging) (Figure 13).

During the initial flurry of scoter activity on April 6, 1990, we observed 150 scoters/hour flying past the cape (110 north and 40 south). On that same morning, R. Jaillet (pers. comm.) reported that thousands of scoters had arrived, and were still arriving, along the coastal waters off Buctouche, NB; about 77 km north of CJNWA. These simultaneous observations suggest that the majority

of scoters migrating in the spring were somehow bypassing the cape and most likely following relatively the same northward route up the Bay of Fundy as the Common Eider. Of interest, Jaillet noted that generally, along the NB coast in the spring, the scoters arrived off Val Comeau in early April, Point Sapin in mid April and off Buctouche. This is noteworthy as Val Comeau is the farthest North of these locations followed by Point Sapin and then Buctouche. The only plausible explanation for this is the timing of ice out along the shore. In early April, Val Comeau is usually ice-free while the more southerly bays along the strait are still frozen over. It is not until later in April that the more southerly areas are clear of ice.

As we did observe some northward movement past the cape, some scoters must fly up the southeastern coast of NS and through the Strait of Canso (or around Cape Breton) and up the Northumberland Strait. This coastal migration along southeastern NS is not new and has been documented as early as the late 1800s (Gilpin 1882). Gilpin also suggested that some scoters may fly up the west coast of Cape Breton and depart directly from Cape North (see Tables 5 and 6 for comparison of numbers).

From our observations and circumstantial evidence, it would appear that the majority of scoters migrate north via the Bay of Fundy. Numerous sources support this theory. Peter Hicklin (pers. comm.) reported that while conducting his eider research in April of 1985 to 1987, on the "Wolves" at the mouth of the Bay of Fundy, he often observed scoters numbering in the thousands flying up the

bay. Furthermore, these flights would continue unabated throughout the morning. Hughson (1972) reported scoters at the Head of the Bay of Fundy during spring surveys with a peak of 500 in April between 1966 - 1971. Squires (1976) reported a large concentration of scoters (1400) near Waterside in the autumn of 1967 and more recently H. Deichmann (as cited in Christie 1980) observed large numbers of scoters moving north east past Cape Enrage.

Most of these scoters are believed to follow the Memramcook/Scoudouc River route north, however, some birds may miss the fork at the mouth of the Petitcodiac River as birds have been observed in Cumberland Basin; just outside of Sackville, N.B. Bateman and McLennan (1973) and Bateman and Turner (1974) both reported small flocks of scoters (<20) during their spring surveys of the Tintamarre NWA.

Reports of large numbers of scoters in the Northumberland Strait are well documented. Tufts (1962) reported rafts containing thousands of White-winged Scoter in the Northumberland Strait in June of 1934. More recently, aerial waterfowl surveys conducted by Bill Barrow (pers. comm.) on April 16 and May 15, 1975, reported 38,158 and 31,695 scoters, respectively, between Shediac and New Carlisle, NB. The largest flocks on April 16 were at Kouchibouguac (16,130), Mirimichi (6,495), Tabusintac (4,472) and Dalhousie (3,939).

These thousands of scoters have long been known to occur along the Northumberland Strait, and eastern and northern shores of NB every spring during their northward migration. This migration

is significant and predictable and it forms the basis of an illegal spring hunt that takes place along the north shore every year.

The largest flock of scoters on record is by D. Christie (pers. comm.) on May 1, 1973. At Dalhousie, NB, he observed a flock of scoters (mostly Black Scoters) estimated to be about 8.5 miles long and containing somewhere in the vicinity of 150,000 birds. Godfrey (1986) speculates on an overland migration of scoters from the Atlantic Coast to James Bay. Chaleur Bay (Escuminac Bay), immediately north of Dalhousie, may well be the staging area for this migration.

During fall migration, data suggests that the scoters fly in a southerly direction, passing entirely through the Northumberland Strait and either fly through the Strait of Canso (or possibly around Cape Breton) then proceed down the eastern seaboard of NS.

As scoters begin making their way south past CJNWA, few birds (5% of all scoters) were observed staging near the cape. The number of southward migrating scoters steadily increased with a peak of 383/hour on October 23. By late October, no individuals were observed sitting on the water and very few (<5/hour) moving north.

It is clear that during the scoters southward migration through the strait, they do not cross overland to the Bay of Fundy; as do the eiders. Compared to the numerous fall eider reports, any "visible" evidence of scoters flying southwest across the Isthmus of Chignecto is completely lacking.

4.10.1 Unidentified scoters

Identification of scoters to species was sometimes difficult (Figure 14). Often White-winged Scoters would stand out at a distance while Surf and Black Scoters could not easily be separated. Five hundred and seventy-six scoters (41% of all scoters observed) were not identified to species. These birds, like those identified, exhibited a more concise, unidirectional flight in the autumn as compared to the spring.

Unidentified scoters were often sighted on mid-November avifaunal surveys with highs of 15 sighted in 1975 (Table 2), Christmas bird counts, maximum of 12 in 1986 (Table 3), and 5 birds reported in the PEINHS newsletter in 1981 (Table 4).

4.10.2 Black Scoter

One hundred and ninety-one (14% of all scoter sightings) were identified as Black Scoters. Northward movement of Black Scoters (Figure 15) comprised the majority of spring observations. Northerly migration of Black Scoters peaked on May 10, though Black Scoter were observed on only two of nine previous counts (March 26 and April 22). The largest numbers migrating south during autumn were 18 birds/hour on October 12.

Black Scoters were also sighted on the mid-November surveys (Table 2), Christmas bird counts (Table 3), and from observations

reported by the members of the PEINHS (Table 4). Small numbers of Black Scoters have been noted from inland NB during spring and autumn (Squires 1976, Christie 1980) with a large flock of 500 Black Scoters near Fredericton in early May of 1967 being the largest recorded (Squires 1976). Christie (1980) categorized the Black Scoter as an abundant spring migrant along the coast of Fundy National Park in the Bay of Fundy.

4.10.3 Surf Scoters

Four hundred and ninety-three (35%) Surf Scoters were identified from CJNWA. Very few Surf Scoters were observed migrating north during the spring observations (Figure 16). Most individuals were observed either flying south or staging in the area. During the autumn, the peak number observed per hour flying south occurred on October 23 (237 birds/hour). The peak number of Surf Scoters migrating south was two weeks later than that observed for Black Scoter moving in the same direction.

As with the Black Scoter, Surf Scoters were noted from mid-November avifaunal surveys (Table 2), Christmas counts (Table 3), and incidental observations worthy of note by PEINHS (Table 4). Christie (1980) also stated that, like the Black Scoter, Surf Scoters are an abundant spring migrant. Inland sightings of Surf Scoters have been noted at Fredericton (Squires 1976) and scattered lakes in NB (Squires 1976, Christie 1980).

4.10.4 White-winged Scoter

One hundred and forty (10% of all scoters) were White-winged. During spring, more than half of the White-winged Scoters were observed travelling south (Figure 17). The remainder of the White-winged Scoters were observed flying north with a peak in numbers of 7 birds/hour on May 3. As soon as the autumn surveys began (September 7), most White-winged Scoters were either flying south or sitting on the water. The largest number observed flying south was 39 birds/hour on October 17. This peak was approximately one week earlier than that for Surf Scoters migrating south and approximately one week later for Black Scoters.

Interestingly, unlike the frequent reports of Black and Surf Scoter off Fundy National Park, White-winged Scoter were rarely observed in the Upper Bay of Fundy in the spring whereas in the fall it was a frequent migrant (Christie 1980). But similar to local reports of Black and Surf Scoters, Christie (1980) and Squires (1976) have records of individuals or small flocks inland.

White-winged Scoters were frequently identified in the mid-November surveys of CJNWA (Table 2), during Christmas bird counts (Table 3), and in sightings by PEI naturalists (Table 4).

4.11 Common Goldeneye (*Bucephala clangula*)

Fifty-five Common Goldeneyes were sighted from Cape Jourimain

during the spring and autumn. Common Goldeneyes often winter in the coastal waters of NB, PEI and NS. They were not, however, sighted in the early spring counts through the Northumberland Strait (Figure 18). The lack of Common Goldeneye sightings during early March observations is attributed to the lack of open water in the area. Between late December and mid-March, Common Goldeneyes frequently congregate in the open waters of narrow channels, rip currents, and ice-free areas associated with causeways and bridges along coastal PEI (MacKinnon 1989).

It appears that as ice moves out of the strait, Common Goldeneyes rapidly leave their wintering areas and begin utilizing the ice-free areas of the strait. As most of the flight observed at the end of March was in a southerly direction, these birds may have been heading for areas of more open water. Pack ice usually enters the strait from the north while to the southeast, past Wood Island-Caribou ferry, there is less ice. Common Goldeneyes may move farther north during the spring (6 birds/hour on April 18) as the ice breaks up from the northerly end of the strait.

In the autumn, Common Goldeneye sightings were sporadic until late November when small flocks were observed flying both north and south along the strait and staging (sitting) on the water. During late autumn to early winter, Common Goldeneye movement throughout the strait may continue as they move to and from their coastal wintering areas.

Sightings of Common Goldeneyes during mid-November avifaunal surveys (Table 2) and Christmas bird counts (Table 3) were often

substantial with 216 on November 20, 1988 and 706 in 1981, respectively (Table 2).

4.12 Red-breasted Merganser

Eight hundred and fifty-eight Red-breasted Mergansers were sighted during observations from CJNWA. Initially, small flocks (<15) of Red-breasted Mergansers were observed from Cape Jourimain (Figure 19); However, after the beginning of April, movement of Red-breasted Mergansers near the cape peaked at 113 birds/hour. After this date, Red-breasted Mergansers were recorded only in small numbers for each hour of observation. During the spring, Red-breasted Mergansers flew south and north, and sat on the water. Flights of Red-breasted Mergansers heading north peaked on April 6 (21 birds/hour), the same date as peak numbers of Red-breasted Mergansers were sighted (113 birds/hour).

The number of Red-breasted Mergansers flying south during the autumn peaked with 53 birds/hour on October 23. Prior to this date, when the maximum number of Red-breasted Mergansers was recorded flying south, they often were noted sitting on the water. On October 17 a large number (156 birds/hour) were flying north. Travelling north by such a large number of Red-breasted Mergansers during this time of year is unexplained. During the last two observation periods (November 27 and December 6) Red-breasted Mergansers were only observed flying south. A second high of 46

birds/hour was observed flying south on the final date of investigation, December 6.

Many Red-breasted Mergansers were also observed on the mid-November surveys of CJNWA (Table 2) and during Christmas bird counts with a peak of 274 in 1981 (Table 3). Large numbers of Red-breasted Mergansers are frequently observed in the strait with highs of 1000 and 1500 at Tidnish, NS, on November 15, 1979 and April 21, 1984 (Table 6).

4.13 Gulls (all species)

Four hundred and eighty-two gulls were sighted. Most of the gulls observed were either Great Black-backed Gulls (23%), Herring Gulls (59%) or gulls not identified to species (18%) (Figure 20). A single Iceland Gull was spotted on April 2 and a Bonaparte's Gull on October 23.

Not surprisingly, as gulls are extremely opportunistic, there were no obvious trends when analyzing the total number of gull observations (Figure 20) or the direction in which they were flying (Figure 21). In the spring, large numbers of gulls were observed April 18-May 15. On April 18, there was a peak in the number of gulls flying north (31 birds/hour). These individuals may have been moving north to breeding colonies or feeding areas. The largest number of gulls sighted during the autumn was 48 birds/hour on October 17.

A number of species of gulls also were noted on mid-November surveys (Table 2) and Christmas bird counts in the Cape Tormentine area (Table 3). The compiler of the Christmas counts, A.D. Smith, recorded almost 8,000 gulls in 1979 when a large number of squid were washed up on the beaches. As gulls are opportunistic the squid provided an easy and quick source of food for the gulls, hence their abundance.

4.14 Miscellaneous seaducks

Seven Brant were sighted during the spring observations (Appendix 1). Five brant were also spotted in 1984 during Christmas bird counts in the Cape Tormentine area (Table 3). Although Brant were once an abundant coastal migrant, the eelgrass die-off during the 1930s resulted in a decline of their numbers. Presently, small flocks of brant still use their traditional coastal route, flying over the Isthmus of Chignecto (Erskine 1988). Flocks numbering in the low hundreds recently have been observed on PEI in spring (MacKinnon 1989).

Two sightings of Common Mergansers (*Mergus merganser*) during the study totalled eight individuals (Appendix 1). Mid-November surveys often recorded Common Merganser in the area (Table 2) as did Christmas bird counts nearby at Cape Tormentine (Table 3), however, these numbers were often small. The majority of wintering Common Mergansers on PEI tend to favour the eastern portion of the

island. As substantial numbers of Common Mergansers also winter in Pictou Harbour (700 on January 10, 1975, Table 6) which is also well east of CJNWA, these birds apparently use a route other than through the strait, either during migration or staging on the way to their wintering areas. Although the number of Common Mergansers wintering on PEI is fairly large (in the low thousands) (Curley and MacKinnon 1988), very few were observed during our surveys.

Thirteen scaup (species not identified) were sighted on March 23 and April 18 (Appendix 1). Greater Scaups (*Aythya marila*) occasionally were sighted on mid-November surveys of CJNWA while both species of scaup were reported on Christmas bird counts at Cape Tormentine (Table 3). Large numbers of Greater Scaups in the range of 4-5 hundred are reported on PEI in the fall. However, this species is neither an abundant migrant or local breeder, except for 85 pairs of Greater Scaup on Grassy Island, NB (A.J. Erskine, pers. comm.).

4.15 Miscellaneous seabirds

One hundred Common Terns (*Sterna hirundo*) were observed on three different survey dates during the autumn (Appendix 1). Although there are breeding colonies of Common Terns numbering over 10,000 pairs (CWS Colonial Waterbird Registry) not far to the north of Cape Jourimain, no observations of terns were recorded during spring.

One Great Blue Heron was sighted travelling south during autumn on September 7 (Appendix 1). Great Blue Herons frequently use the intertidal waters around Cape Jourimain throughout the summer and have been observed in mid-November during the annual avifauna survey (Table 2). Sightings of this species later than November are rare.

5.0 CONCLUSIONS

This study, as well as documenting seaduck and seabird movement through the strait, gathers current information from a variety of sources. Its publication is a timely result of the possibility of the proposed fixed link between NB and PEI. As full day (dawn-dusk) surveys were not conducted, we can not speculate on the actual number, by species, utilizing the Northumberland Strait.

It is obvious from the timing and peak number of seabirds and seaducks observed moving through and utilizing the Northumberland Strait that it is important to a number of species. Further, it may be crucially important for some species such as scoters who migrate south past the Cape Jourimain headland in large numbers.

This paper stands as a resource document. We do not try to propose mitigative measures should a connection between NB and PEI be built. Should the structure be built in the near future and with an expected completion time of approximately 5 years, this data set can be used to document any changes in bird use over time

by duplicating the methodology in the future.

The seasonal peak in the number of birds observed immediately seaward of Cape Jourimain occurred on April 6 during the spring and on October 30 during the autumn. Summer and winter surveys were not conducted. Fluctuations in bird numbers moving through the strait were species dependant. Peak numbers of movement for individual species are noted within.

At present, parts of the Northumberland Strait (such as coastal bays e.g. Baie Verte), may be important summer habitat for non-breeding Common Loon and moulting Red-necked Grebe. The highly productive waters of the strait are important feeding areas for species such as the Northern Gannet, Great and Double-crested Cormorant and Common Tern. Waterfowl, such as Canada Goose, Common Goldeneye, and Common Merganser, may depend on the strait for staging, roosting, feeding, and loafing during the spring and autumn. Seaducks, such as scoters and eiders, also migrate through the strait in large numbers.

Although the long-term effect of a fixed link is unknown, many aquatic birds are hesitant to fly overland and over man-made structures. Surprisingly, this includes eiders despite their willingness to migrate overland. Erskine and Smith (1986) reported that, although the Canso causeway is a short and low structure, eiders have been reported to fly through the Strait of Canso, follow along the causeway to meet land, gain altitude of at least 100 m, and only then pass over the man-made structure.

Although dawn to dusk counts were not conducted, from our

observations we can extrapolate to predict the approximate number of birds migrating through the strait. Our surveys do not include the summer or winter months, nor can we predict nocturnal bird movement. It is true, however, that our observations represent minimum bird numbers for the representative hourly surveys. Thus, our very conservative estimate of spring and fall bird movement through the Northumberland Strait during the day (based on average daylight hours between initiation and ending of surveys) are 125 and 300 thousand birds respectively, totalling 425 thousand birds. The approximation of these numbers must be stressed. However, they are very definitely conservative estimates that are provided to give some insight into the importance of the Northumberland Strait to seaducks and seabirds.

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Note: Many of these reports are hard to obtain. Should readers require primary literature, all references have been deposited in the Canadian Wildlife Service library, P.O. Box 1590, Sackville, N.B. E0A 3C0

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Table 1. Observations of bird movements immediately seaward of Cape Jourimain NMA, 1989. Values recorded are in number of birds observed per hour of observation (from MacKinnon and Hicks, 1991b).

Species	April 12				April 20				OBSERVATION DATES		Sept. 14				Sept. 26			
	N	S	W	T	N	S	W	T	May 2*	May 16*	N	S	W	T	N	S	W	T
Northern Gannet	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
Great Cormorant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D.C. Cormorant	-	-	-	-	-	4	-	4	-	1	-	-	-	-	2	3	-	5
Cormorant sp.	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Great Blue Heron	-	-	-	-	-	-	-	-	3	-	-	-	1	1	-	-	-	-
Brant	-	11	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Duck	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Common Eider	-	-	8	8	-	-	-	-	2	1	-	-	18	18	-	-	31	31
Oldsquaw	-	-	8	8	-	-	2	2	9	-	-	-	-	-	-	-	-	-
Black Scoter	-	10	-	10	-	13	-	13	10	-	-	-	-	-	2	70	-	72
Surf Scoter	-	-	-	-	-	-	-	-	-	-	-	32	19	51	-	-	-	-
White-winged Scoter	30	-	-	30	-	-	-	-	1	-	4	-	-	4	-	-	-	-
Scoter sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Common Goldeneye	-	-	-	-	1	-	-	1	-	-	-	22	-	22	-	-	-	-
Common Merganser	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red-breasted Merganser	9	2	6	17	15	4	4	23	29	38	-	-	-	-	4	5	-	9
Merganser sp.	-	-	-	-	-	-	-	-	-	-	-	4	-	4	-	-	-	-
Waterfowl sp.	-	-	-	-	-	2	-	2	-	-	-	-	-	-	-	-	-	-
Herring Gull	-	-	-	-	-	2	-	2	5	-	4	-	-	4	4	4	-	8
Great Black-backed Gull	-	-	-	-	2	-	-	2	75	-	-	-	-	-	2	-	-	2
Gull sp.	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-
Common Tern	-	-	-	-	-	-	-	-	-	-	2	-	-	2	-	-	-	-
Total	41	23	22	86	19	25	7	51	135	40	10	58	38	106	14	82	31	127

*North/south movement not segregated

N = Flying Northwest S = Flying Southeast W = Sitting on water T = Totals

Table 3. Observations of selected seabird/seaduck species from Christmas bird counts* at Cape Tormentine, 1961-1990.

[illegible]

Table 3. (cont'd)

Year of count

[illegible]

Table 3. (cont'd)

Year of count

Species	81	82	83	84	85	86	87	88	89	90
Red-throated Loon	-	-	2	-	-	-	-	-	-	-
Common Loon	-	1	1	1	-	-	-	-	-	1
Horned Grebe	1	-	3	-	-	-	-	-	-	-
Red-necked Grebe	1	-	-	-	-	-	-	-	-	1
Northern Gannet	-	7	-	-	-	-	-	-	-	-
Great Cormorant	6	-	1	-	-	-	-	-	-	-
D.-c. Cormorant	-	-	-	-	-	-	-	-	-	-
cormorant (spp.)	-	-	-	-	-	-	-	-	-	-
Brant	-	-	-	5	-	-	-	-	-	-
Canada Goose	295	15	159	1373	-	15	94	-	325	13
Black Duck	365	359	486	1	-	22	-	1	20	-
Greater Scaup	3	1	-	2	-	-	-	-	26	2
Lesser Scaup	-	-	-	-	-	-	-	-	-	3
Common Eider	14	24	36	12	8	11	20	41	24	14
Oldsquaw	177	1153	109	207	99	1184	298	320	773	362
Black Scoter	-	1	1	14	-	-	-	1	-	2
Surf Scoter	2	1	3	4	-	-	1	-	-	1
White-w. Scoter	25	-	5	16	4	-	1	-	-	3
scoter (spp.)	-	-	-	-	-	12	-	-	-	-
Common Goldeneye	706	147	257	523	52	260	159	42	30	96
Bufflehead	-	2	-	-	-	-	-	-	-	1
Common Merganser	10	25	10	8	10	44	-	20	4	11
Red-b. Merganser	274	228	54	92	76	255	27	80	77	187
duck (unk. spp.)	14	-	147	20	38	-	-	1	-	-
C. B.-headed Gull	-	-	-	-	-	-	-	-	-	-
Bonaparte's Gull	-	-	-	-	-	-	-	-	-	-
Ring-billed Gull	252	25	61	70	3	3	18	-	3	67
Herring Gull	162	165	179	419	59	90	128	81	111	508
Iceland Gull	128	161	54	103	56	84	97	80	45	226
Glaucous Gull	-	-	1	-	-	-	-	-	2	5
G. B.-backed Gull	116	90	157	122	87	48	139	295	153	508
B.-leg Kittiwake	-	-	-	-	-	-	-	-	-	-
Ivory Gull	-	-	-	-	-	-	-	-	-	-
gull (unk. spp.)	-	19	-	-	-	1	-	-	-	-
Dovekie	-	-	-	-	-	-	-	-	-	1
Thick-b. Murre	-	-	-	-	-	-	-	-	-	1

* - Christmas bird counts conducted from December 14 to December 28, all observations were conducted within a 12 km radius centered 1.8 km east of Melrose post office, Botsford County, New Brunswick.

Table 4. Selected seabird observations along the Northumberland Strait that were noted in the Prince Edward Island Natural History Society newsletter, January 1978-January 1990.

Number/ Species	Location	Date	Authority (ies)
6 Red-throated Loon	Borden Ferry	Oct. 23, 1982	G. Hogan
3 "	Wood Island Ferry	Oct. 13, 1984	J. Burton, G. Hogan et al.
1 "	Brae Harbour	Aug. 24, 1988	A. Clements
2 "	Hebron	Aug. 30, 1988	"
1 Common Loon	West Point	May 17, 1980	G. Hogan & J. Alwey
15 "	Argyle Shore	May ?, 1981	A. MacPhail
9 "	"	June 11, 1981	"
1 "	Enmore	June 4, 1982	U.P.E.I. students
1 "	Borden Ferry	Oct. 23, 1982	G. Hogan
16 "	Wood Island Ferry	Oct. 13, 1984	J. Burton, G. Hogan et al.
7 "	Hebron sandspit	Aug. 14, 1986	A. Clements
1 "	Guernsey Cove	Oct. 4, 1988	B. Peripoli
12 "	Seacow Head	Aug. 1, 1990	D. MacAskill, M. Smith
12 loon (unk. spp.)	Borden Ferry	Oct. 17, 1981	?
9 "	Tormentine Ferry	"	"
2 "	West Point	Nov. 22, 1981	G. Hogan, W. Cairns & S. Stephenson
1 "	Borden Ferry	Aug. 12, 1984	V. Beer & G. Hogan
1 Red-necked Grebe	Borden Ferry	Oct. 17, 1981	?
1 Greater Shearwater	Borden Ferry	Aug. 21, 1978	Dr. M. Edwards
1 Wilson's Storm Petrel	Wood Island Ferry	Oct. 4, 1981	G. Hogan
1 Leach's Storm Petrel	Borden Ferry	Oct. 17, 1981	?
1 storm petrel	Wood Island Ferry	Oct. 13, 1984	J. Burton G. Hogan et al.

Table 4. (cont'd)

Number/Species	Location	Date	Authority (ies)
? Northern Gannet	Wood Island Ferry	Oct. 18, 1979	A. Godfrey, F.R. Curley et al.
1 "	"	Nov. 17, 1979	D. Cairns
1 "	"	May 11, 1980	G. Hogan & J. Alway
5 "	Borden Ferry	Oct. 27, 1980	F.R. Curley
9 "	"	Sep. 23, 1981	G. Hogan
2 "	Wood Island Ferry	Oct. 4, 1981	"
12 "	Borden Ferry	Oct. 17, 1981	"
12 "	Cape Tormentine Ferry	Oct. 17, 1981	"
1 "	Borden Ferry	Oct. 23, 1982	G. Hogan
1 "	Wood Island Ferry	May 22, 1983	D. Cairns?
5 "	Borden Ferry	Aug. 12, 1984	V. Beer & G. Hogan
? "	Wood Island Ferry	Oct. 13, 1984	J. Burton
3 "	"	Oct. 14, 1984	G. Hogan et al. C. & M. Willms
2 D.-crested Cormorant	Wood Island Ferry	Sep. 16, 1984	F.R. Curley & L. Townsend
? "	"	Oct. 13, 1984	J. Burton
30 "	North River	Apr. 24, 1985	G. Hogan et al. M. Copplestone & T. Reddin
20 "	Point Prim	May 18, 1986	T. Murchison
10 "	Charlottetown harbour	May 3, 1990	D. Macaskill
1 "	North River	Dec. 13, 1990	Burka family
5 C. Eider	Point Prim	Nov. 14, 1981	G. Hogan
4 "	Borden Ferry	Apr. 21, 1983	E. Tull
2 "	"	July 25, 1990	D. Sabine
25 Oldsquaw	Point Prim	Nov. 14, 1981	G. Hogan
1 "	West Point	Nov. 22, 1981	G. Hogan, W. Cairns & S. Stephenson

Table 4. (cont'd)

Number/ Species	Location	Date	Authority (ies)
3 Oldsquaw	Borden Ferry	Apr. 9, 1982	G. Hogan
24 "	"	Oct. 23, 1982	"
15 "	"	Apr. 21, 1983	E. Tull
1 Black Scoter	Borden Ferry	Apr. 9, 1982	G. Hogan
6 "	"	Oct. 23, 1982	"
1 "	Hillsborough Bridge	Feb. 7, 1986	B. Dalzell
6 Surf Scoter	Point Prim	Nov. 14, 1981	G. Hogan
1 "	Borden Ferry	Oct. 23, 1982	"
15 "	"	Apr. 21, 1983	E. Tull
16 "	Wood Island Ferry	Oct. 13, 1984	J. Burton
8 "	"	Aug. 10, 1990	G. Hogan et al. D. Sabine & S. Makepeace
4 White-winged Scoter	West Point	May 17, 1980	G. Hogan & J. Alway
?	Borden Ferry	Oct. 23, 1982	G. Hogan
30 "	"	Apr. 21, 1983	E. Tull
6 "	Wood Island	Oct. 13, 1984	J. Burton
5 scoter (unk. spp)	Cape Tormentine Ferry	Oct. 17, 1981	G. Hogan et al. ?
12 C. Goldeneye	Point Prim	Nov. 14, 1981	G. Hogan
10 R.-breasted Merganser	Wood Island Ferry	Sep. 16, 1984	F.R. Curley & L. Townsend
1 Black Guillemot	Borden Ferry	Apr. 21, 1983	E. Tull
1 "	Seacow Head	June 21, 1986	F.R. Curley
1 Dovekie	Wood Island Ferry	Feb. 2, 1987	K. Gamble

Table 5. Selected seabird observations along the Northumberland Strait and the upper Bay of Fundy that were noted in the New Brunswick Naturalist (Nature Notes), 1960-1990.

Number/ Species	Location	Date	Authority (ies)
1 Red-throated Loon	Buctouche	Aug. 8, 1970	P. Pearce
200 "	Dalhousie	Apr. 28, 1972	Jean-Paul Lebel
410 "	Cape Jourmain	Oct. 23, 1986	
	National Wildlife Area		
24 Horned Grebe	Baie Verte	Wint. 1960/61	A. Goodwin
1 Northern Gannet	Richibucto Cape	Sep. 23, 1962	A. Madden
1 "	Buctouche	July 12, 1970	P. Pearce
2 "	Cape Enrage	Apr. 3, 1970	E. Tull
30 "	Buctouche Bar	May 22, 1970	P. Pearce
225 "	Kouchibouguac	July 13, 1973	E. Tull
	National Park		
1000 "	Miscou Island	May 25, 1975	Chaisson ?
2 " (imm.)	Cape Tormentine	Dec. 12, 1980	S. Tingley
4000 Common Eider	Lakeburn (Moncton)	April 5, 1965	E. Price
200 "	flying NE over Memramcook	March 1, 1970	R. McManus
200 " (males)	flying W along Memramcook R.	Oct. 2, 1970	D. Christie and M. Majka
300 " (males)	"moulting" off Waterside	June 29, 1971	M. Majka
450 "	Shediac Bay	Oct. 21, 1972	Moncton Naturalist Club
5000 "	Waterside	Apr. 24, 1973	B. Bradbury
1000 Oldsquaw	Jacquet River	April 9, 1966	Frere Jean-Paul Lebel

Table 5. (cont'd)

Number/ Species	Location	Date	Authority (ies)
700 Black Scoter	Waterside	Apr. 25, 1963	Frere Jean-Paul Lebel
100s " (flocks of 15-40)	flying NE past Point LePreau	Apr. 8, 1973	Johnston
4500 "	Dalhousie	Apr. 16, 1973	Frere Jean-Paul Lebel
5000 "	Waterside	Apr. 24, 1973	B. Bradbury
150,000 "	Dalhousie (Escuninac Bay)	May 1, 1973	D. Christie
3000 "	Waterside	Apr. 5, 1983	R. Walker
4450 "	Waterside	Apr. 20, 1983	R. Walker
8400 Surf Scoter	Point-la-Nim	Apr. 26, 1970	A. Madden
10,000 "	between Campbellton and Dalhousie	May 3, 1970	A. Madden
10,000 "	Waterside	Apr. 24, 1973	B. Bradbury
8000 Surf and Black Scoters	Richibucto Hbr.	May 9, 1973	E. Tull

Table 6. Selected seabird observations along the Northumberland Strait that were noted in Nova Scotia Birds (N.S. Bird Society Newsletter) 1964-1990.

Number/ Species	Location	Date	Authority (ies)
70 Red-throated Loon	Cape Tormentine	Oct. 26, 1975	S. Tingley
25 "	Cape Jourmain	Nov. 15, 1976	"
25 "	Tidnish Dock	Oct. 30, 1978	"
90 "	Cape Jourmain	Nov. 19, 1979	?
8 "	Tidnish	Nov. 17, 1980	S. Tingley
25 "	Tidnish-P. Phillip	Nov. 25, 1980	"
55 "	Cape Tormentine	Nov. 26, 1980	"
1 "	Tidnish	spring, 1985	?
22 Common Loon	Pictou	Sep. 2, 1969	E. Holdway
16 "	"	Sep. 16, 1969	"
10 "	Tidnish	Oct. 27, 1975	S. Tingley
33 "	Tidnish-Wallace	Sep. 30, 1979	"
30 "	Tidnish Dock	Oct. 29, 1983	"
45 "	"	Sep. 10, 1986	"
7 Red-necked Grebe	Tidnish	Oct. 11, 1968	A. Erskine
10 "	"	Oct. 27, 1975	S. Tingley
30 "	"	Nov. 12, 1975	"
40 "	Tidnish-Wallace	Sep. 30, 1979	N.S. Bird Society
45 "	Tidnish Dock	Nov. 15, 1979	S. Tingley
30 "	Tidnish	Nov. 3, 1980	"
75 "	"	Nov. 17, 1980	"
75 "	"	Nov. 24, 1980	"
25 "	"	Dec. 8, 1980	"
35 "	Tidnish Dock	Nov. 2, 1981	S. Tingley et al.
35 "	"	Oct. 29, 1983	S. Tingley
135 "	Tidnish	Sep. 10, 1986	"
225 "	"	Oct. 10, 1986	"
1 Horned Grebe	Pictou	Oct. 15, 1966	E. Holdway

Table 6. (cont'd)

Number/ Species	Location	Date	Authority (ies)
28 Horned Grebe	Tatamagouche	Nov. 12, 1975	S. Tingley
18 "	Tidnish Dock	Oct. 30, 1978	"
10 "	Tidnish-Wallace	Sep. 30, 1979	"
25 "	Tidnish Dock	Oct. 18, 1979	?
20 "	Tidnish	Nov. 3, 1980	S. Tingley
30 "	"	Nov. 17, 1980	"
15 "	"	Dec. 8, 1980	"
13 "	Tidnish Dock	Nov. 2, 1981	S. Tingley et al.
7 Northern Gannet	Pictou	Aug. 7, 1973	E. MacLeod
1 "	Cape Jourimain	Nov. 15, 1976	C. Desplanque
30 "	Northport	Oct. 18, 1979	S. Tingley
5 "	Tidnish Dock	Oct. 18, 1979	"
1 "	Cape Jourimain	Nov. 25, 1980	"
20 "	Caribou Island	Oct. 11, 1989	D. Purchase
50 D.-crested Cormorant	Tatamagouche	Oct. 27, 1975	S. Tingley
1 "	Pugwash R.	Dec. 4, 1978	"
18 Canada Goose	N.S.-P.E.I.	Aug. 23, 1964	E. Holdway
100 Common Eider	Cape Jourimain	July 1, 1976	C. Desplanque
27 "	Fort Lawrence	Nov. 6, 1978	S. Tingley et al.
16 Black Scoter	Pictou	Nov. 27, 1972	E. Holdway
20 "	Cape Jourimain	June 21, 1976	C. Desplanque
10 "	"	June 26, 1976	"
8 "	"	July 1, 1976	"
20 "	Caribou Harbour	May 18, 1985	F. Lavender et al.
3 "	"	July 4, 1982	?
40 "	Tidnish	May 18, 1985	F. Lavender et al.

Table 6. (cont'd)

Number/ Species	Location	Date	Authority (ies)
2 Surf Scoter	Northport	? 1985	?
250 "	"	Sep. 10, 1986	S. Tingley
100s "	Lorneville	May 9, 1988	Cohr's Family
5 White-winged Scoters	Cape Jourimain	July 1, 1976	C. Desplanque
600 R.-breasted Merganser	Pictou	Apr. 9, 1973	E. Holdway
500 "	"	Apr. 15, 1973	"
200 "	Tidnish	Apr. 27, 1975	S. Tingley
170 "	Pictou causeway	Nov. 30, 1976	E. Holdway
80 "	"	Apr. 5, 1978	"
1000 "	Tidnish Dock	Nov. 15, 1979	S. Tingley
1200 "	Tidnish-Port Philip	? 1981	D. MacDougall
400 "	Northumber. Strait	Mar. 2, 1981	F. Lavender et al.
1500 "	Tidnish-Tatamagou.	Apr. 21, 1984	I. McLaren et al.
1000 "	Northport	? 1986	"
200 "	Linden	Oct. 27, 1986	S. Tingley
200 "	Caribou	Oct. 29, 1986	"
700 Common Merganser	Pictou causeway	Jan. 16, 1975	S. Tingley et al.
23 "	"	Dec. 27, 1978	S. Tingley
26 "	Pictou Harbour	Mar. 28, 1978	E. Holdway
52 "	Pugwash	Jan. 25, 1980	S. Tingley
81 "	Tidnish-Pugwash	Mar. 22, 1980	"
60 "	Northumber. Strait	Mar. 2, 1981	D. MacDougall
425 "	Pictou Harbour	Dec. 10, 1982	B. Dalzell
300 "	"	Feb. 19, 1986	A. Vienneau
100 "	Pictou causeway	Feb. 6, 1988	"

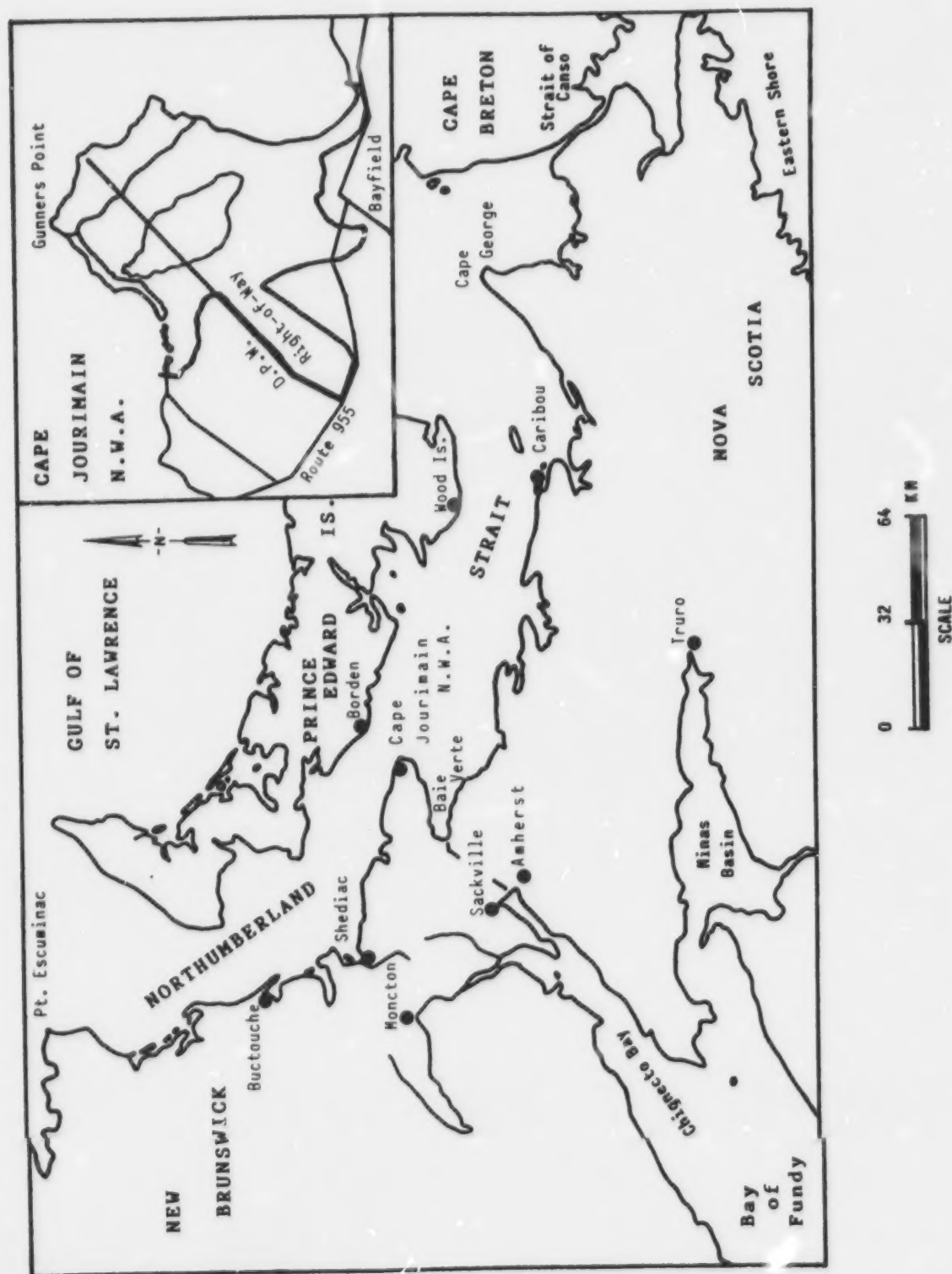


Figure 1. Map of study area including key points of interest.

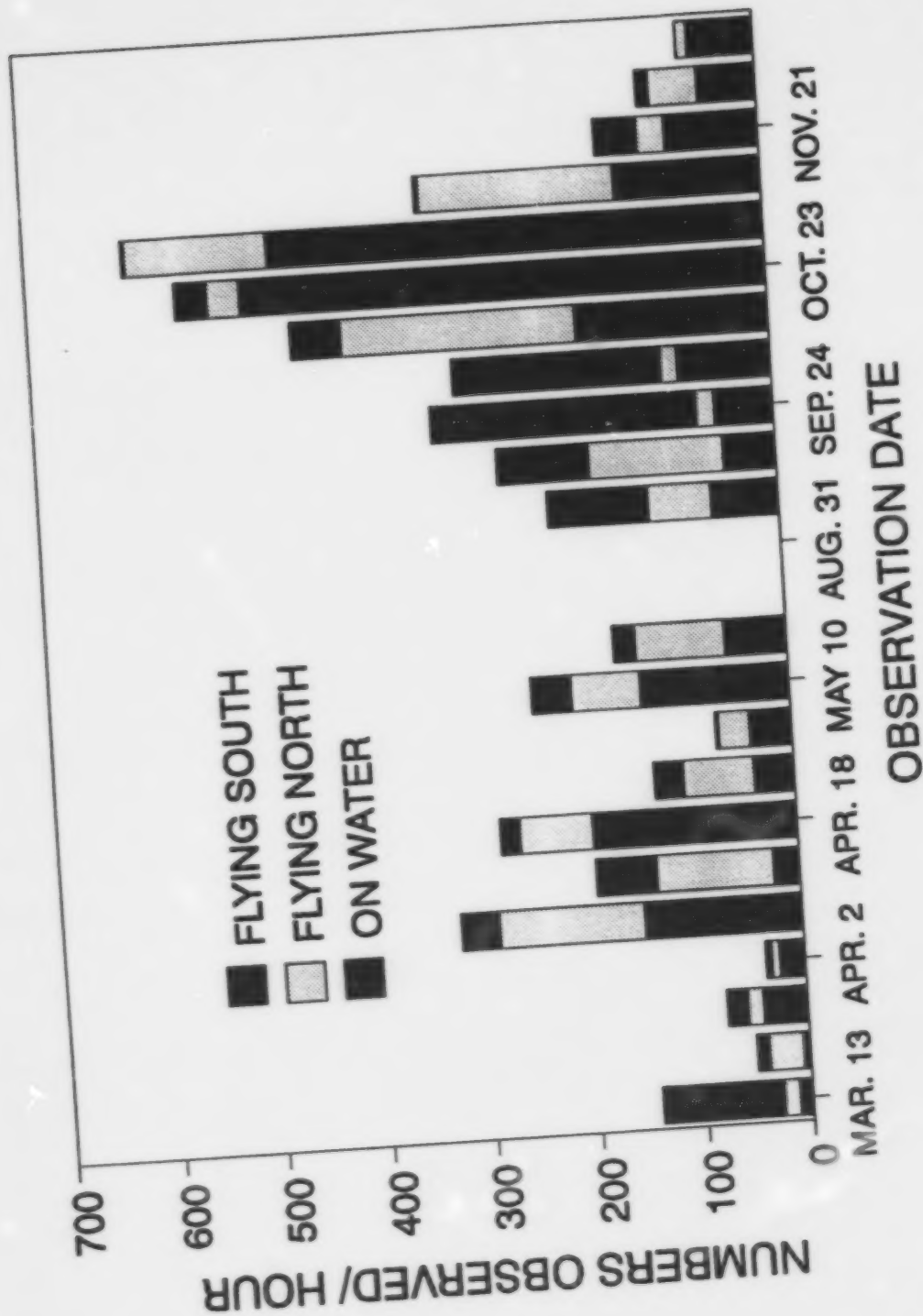


Figure 2. Number and direction of movement of birds observed in the Northumberland Strait from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

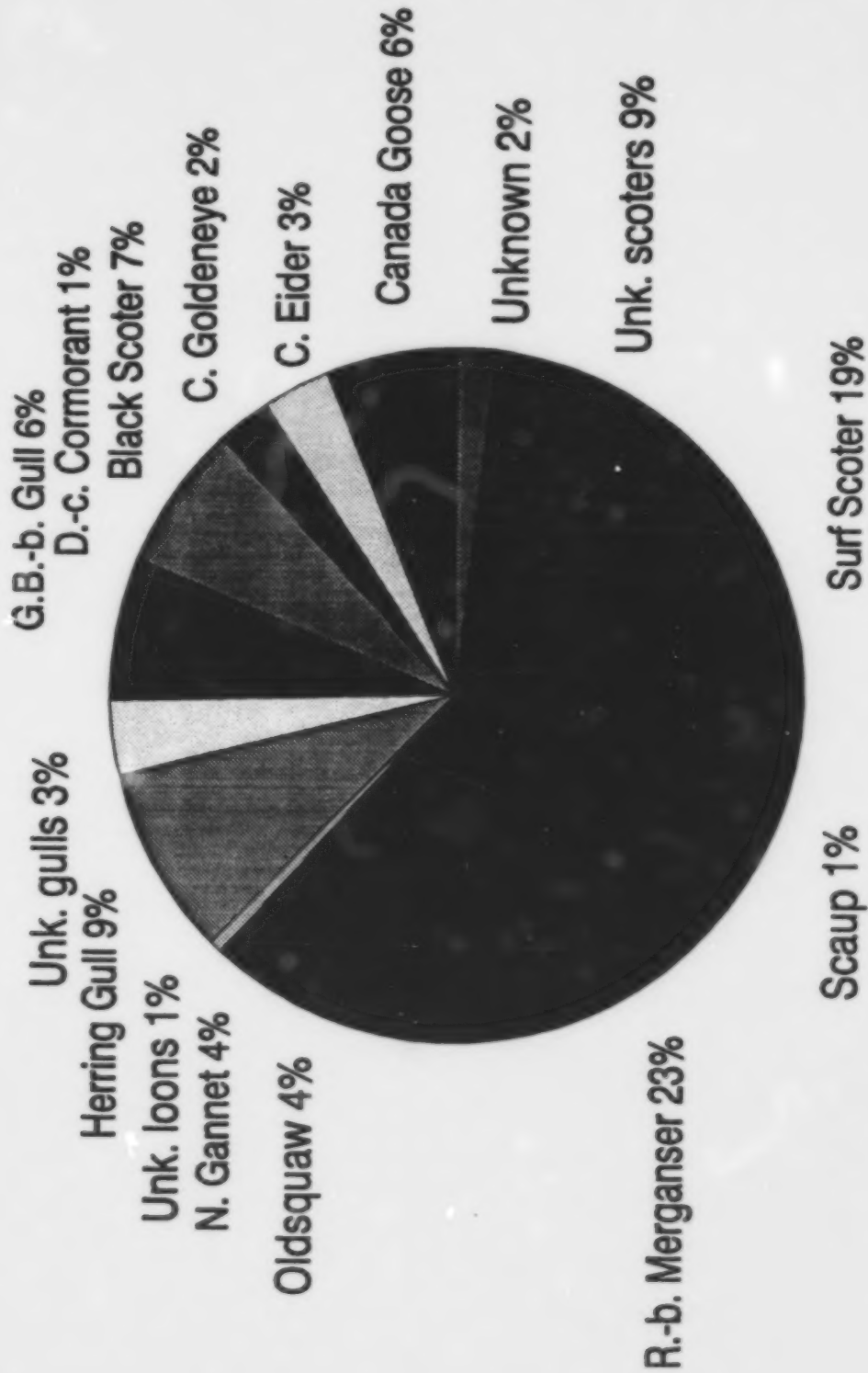


Figure 3. Key species observed moving through the Northumberland Strait during the spring. observations from Cape Jourimain NWA, March 13 - May 15, 1990 (N = 1600). Incidental observations not included.

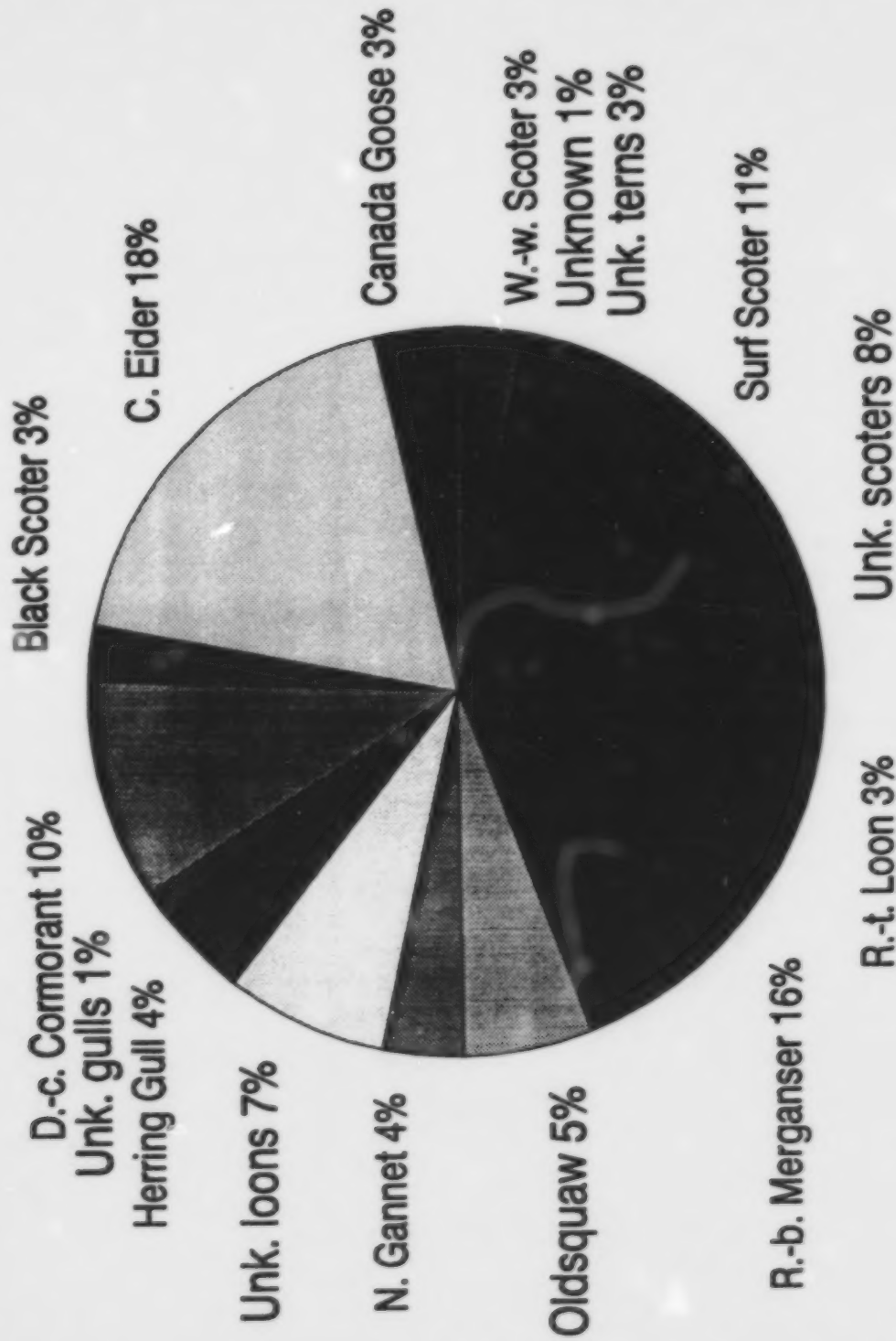


Figure 4. Key species observed moving through the Northumberland Strait during the autumn, observations from Cape Jourimain NWA, September 7 - December 6, 1990 (N = 3220). Incidental observations not included.

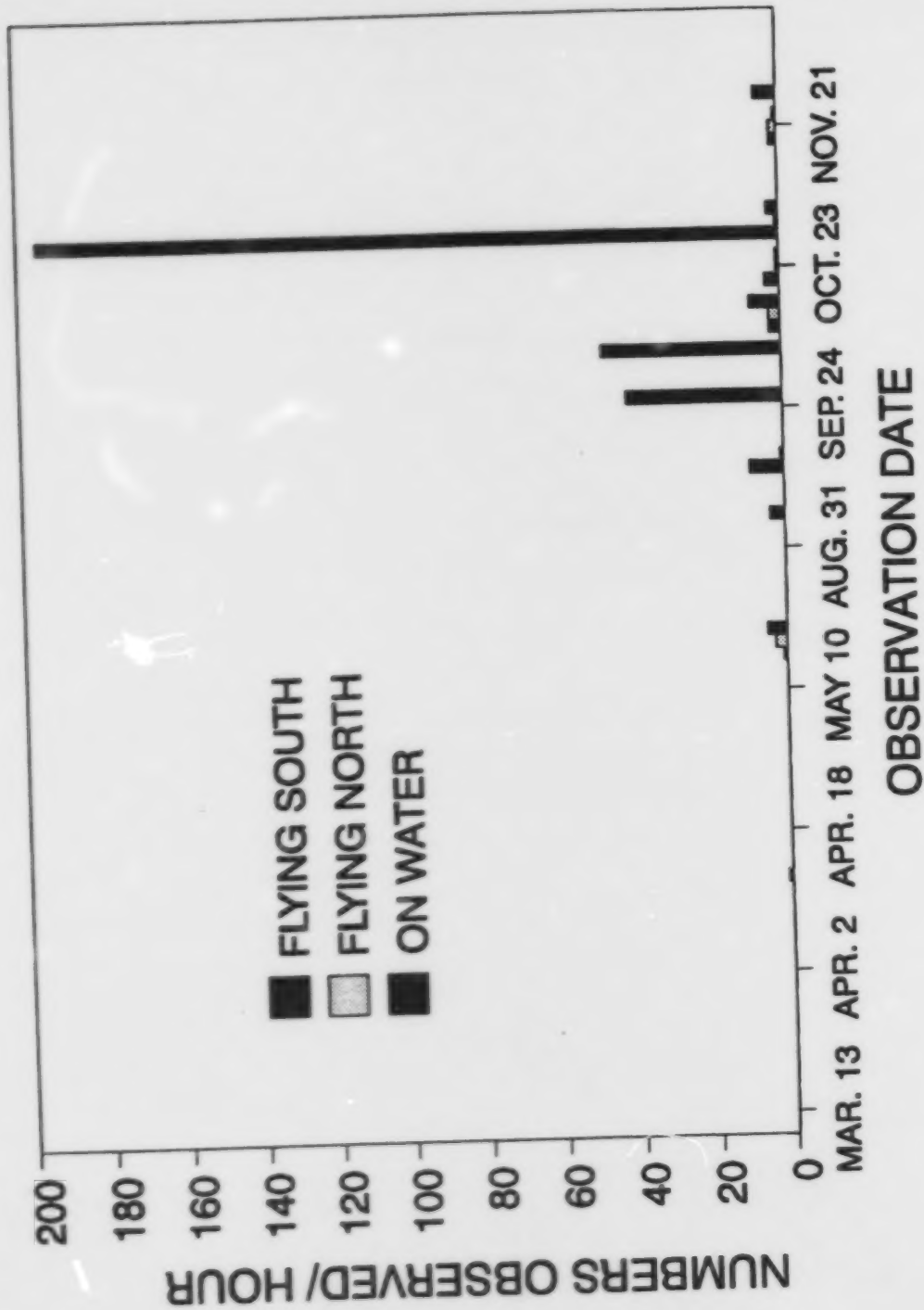


Figure 5. Loon (all spp.) movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

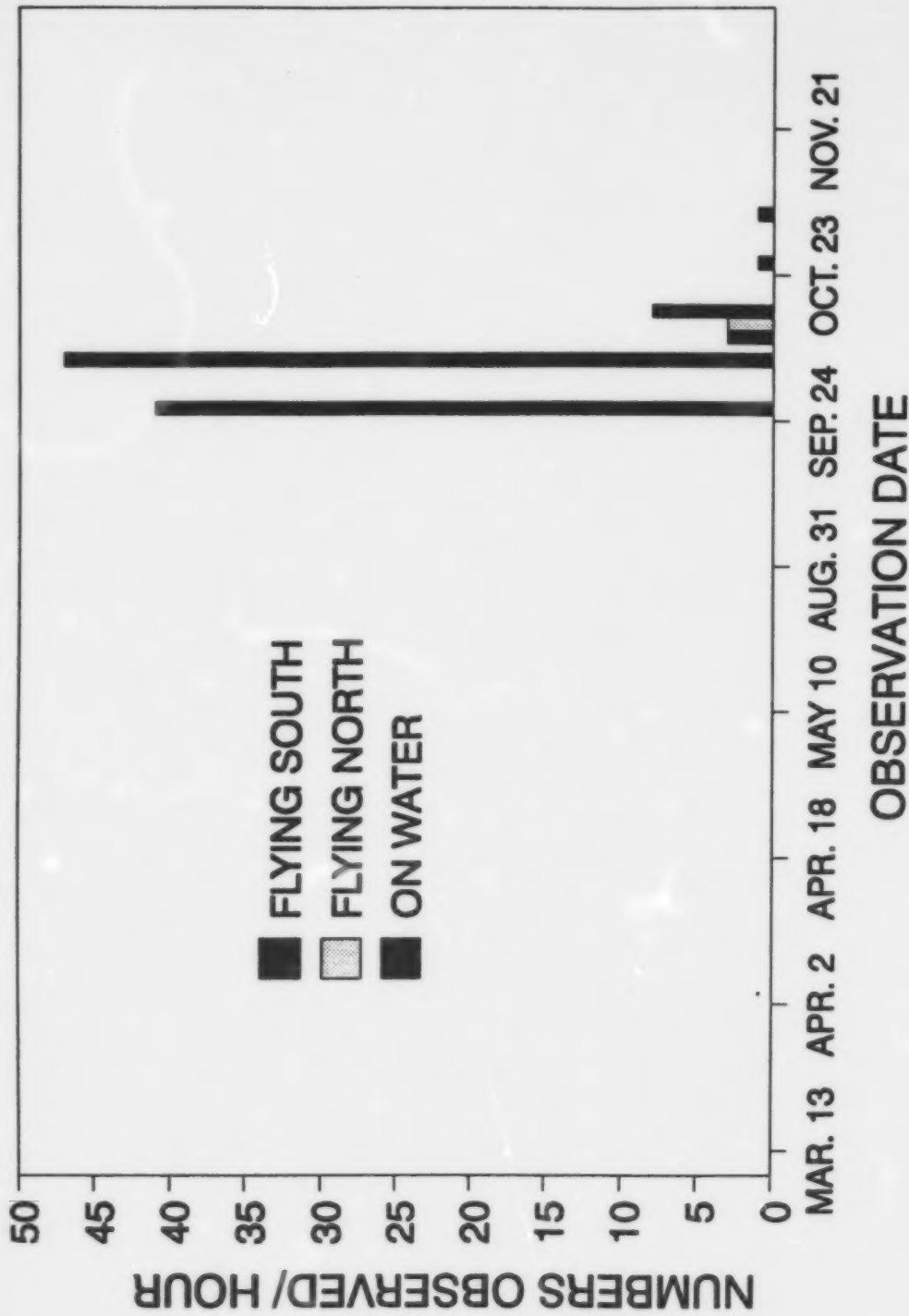


Figure 6. Red-throated Loon movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

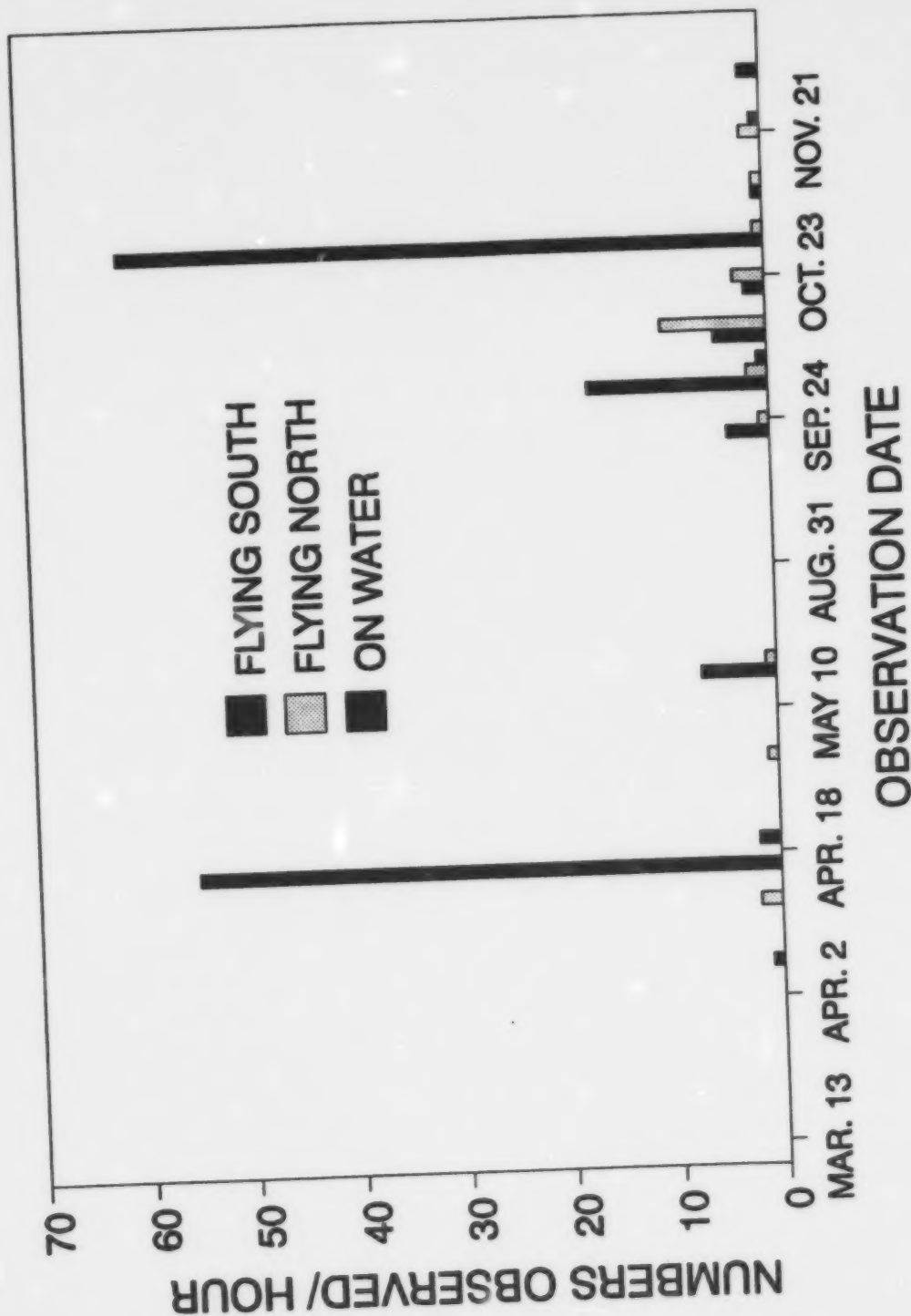


Figure 7. Northern Gannet movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

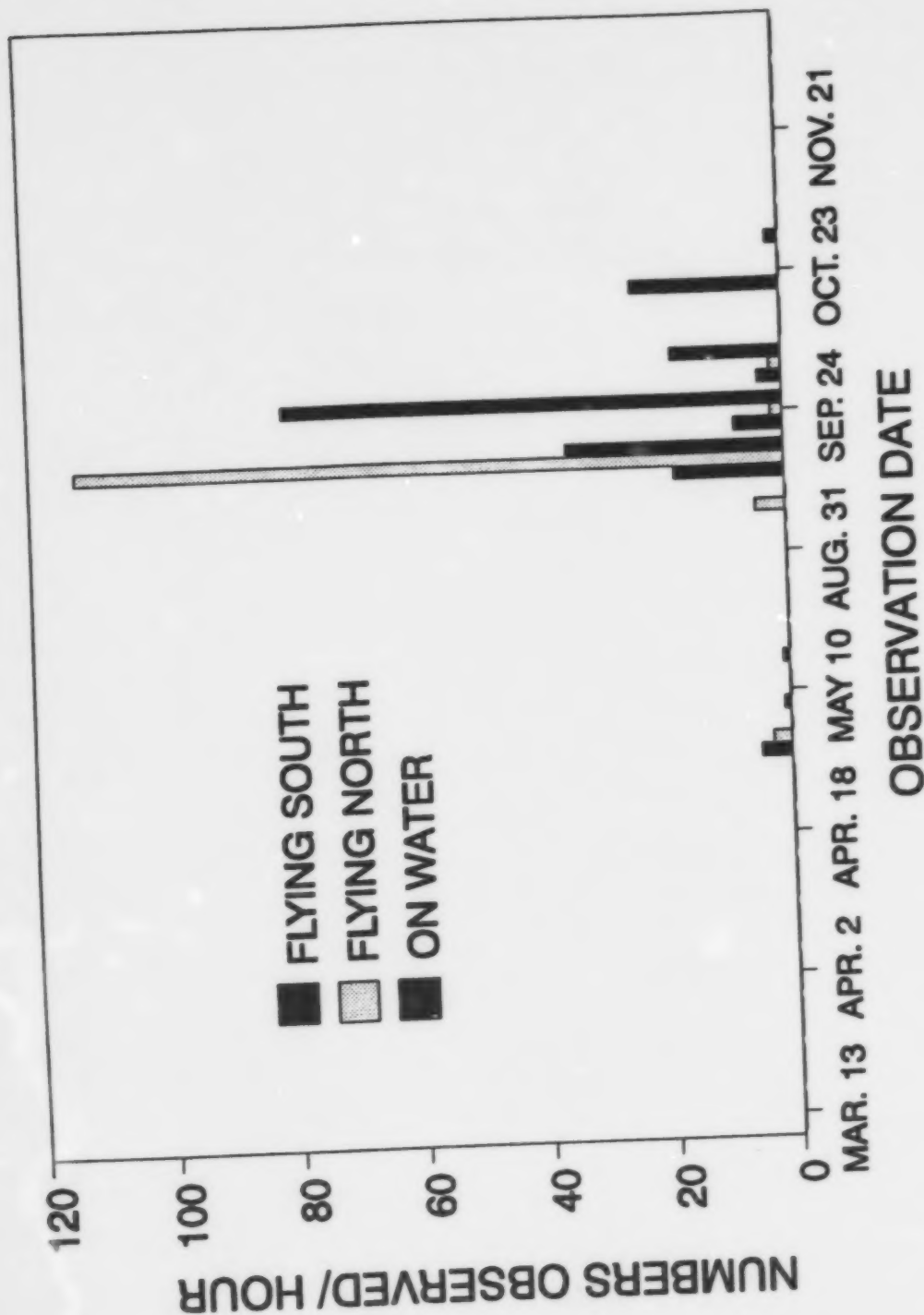


Figure 8. Double-crested Cormorant movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

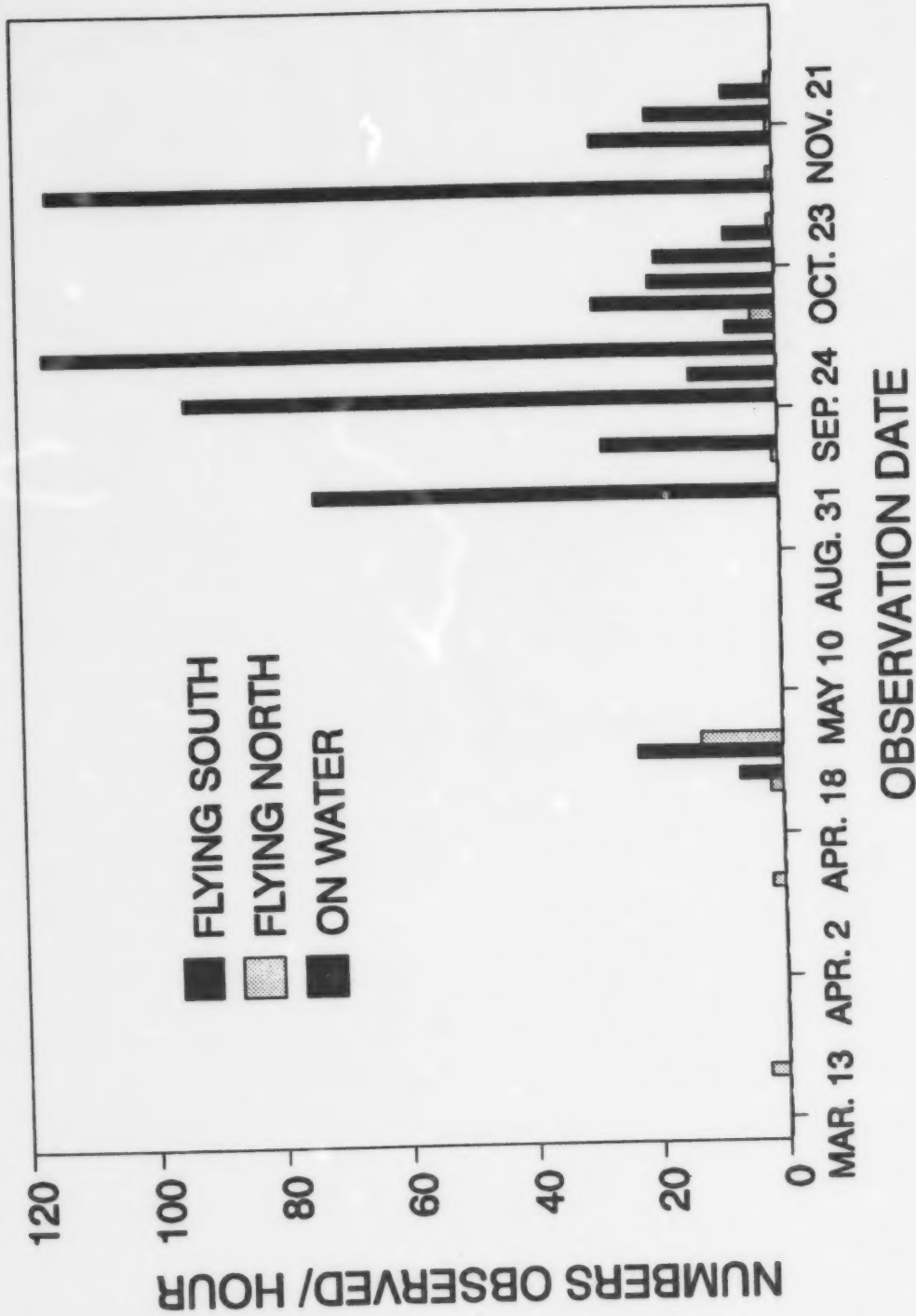


Figure 9. Common Eider movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

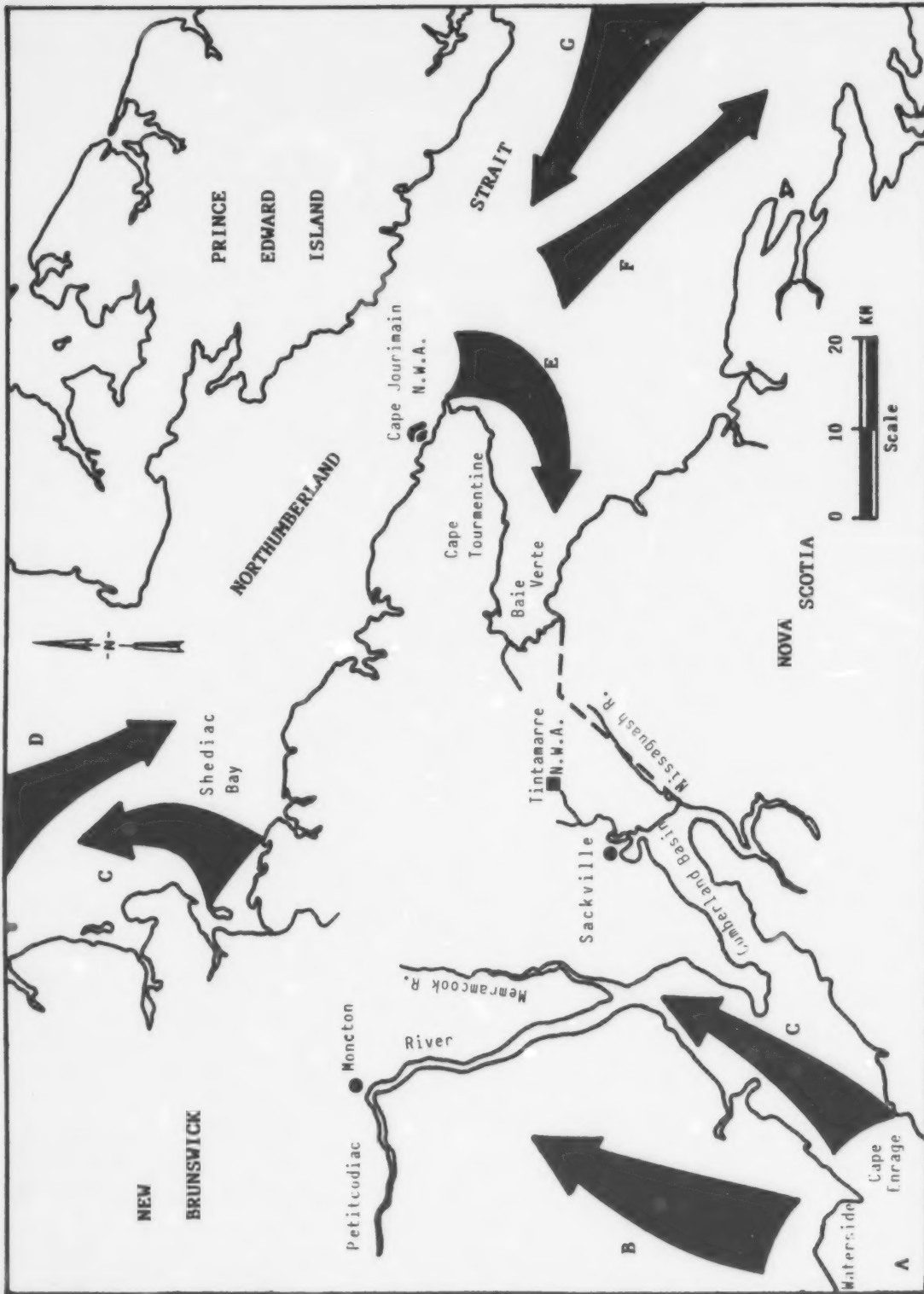


Figure 10. Speculation on scoter and eider migration in relation to the Northumberland Strait.

A. Scoter and eider spring staging area at Waterside. B. Overland migration from Waterside. C. Major flyway up Memramcook River, down Scoudouc River to Shediac Bay (Northumberland Strait). D. Southerly movement of scoters and eiders. E. Large southerly migration of eider across the Chignecto Isthmus. F. Large southerly migration along coast of the Northumberland Strait. G. Northerly migration of scoter and eider. (See text for detail.)

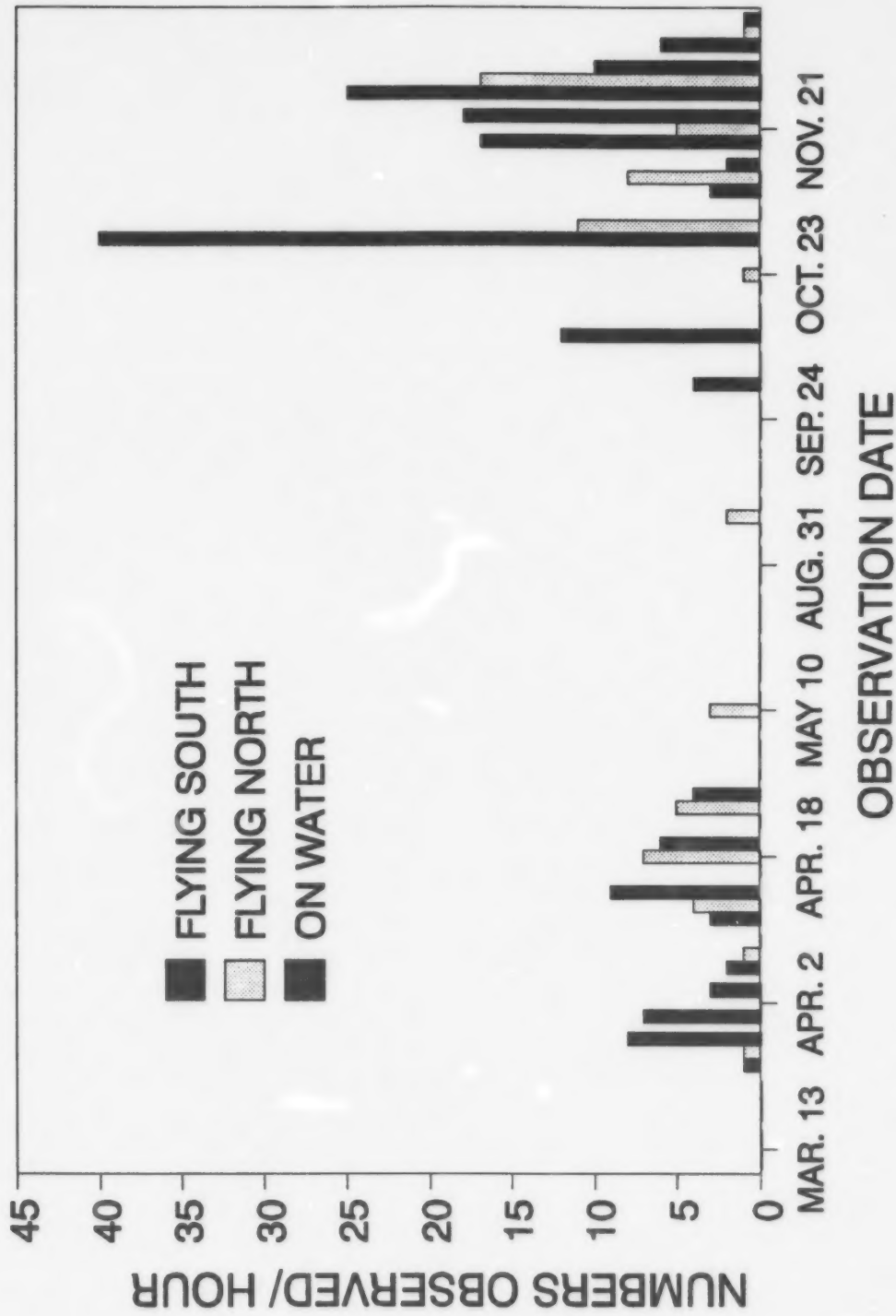


Figure 11. Oldsquaw movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

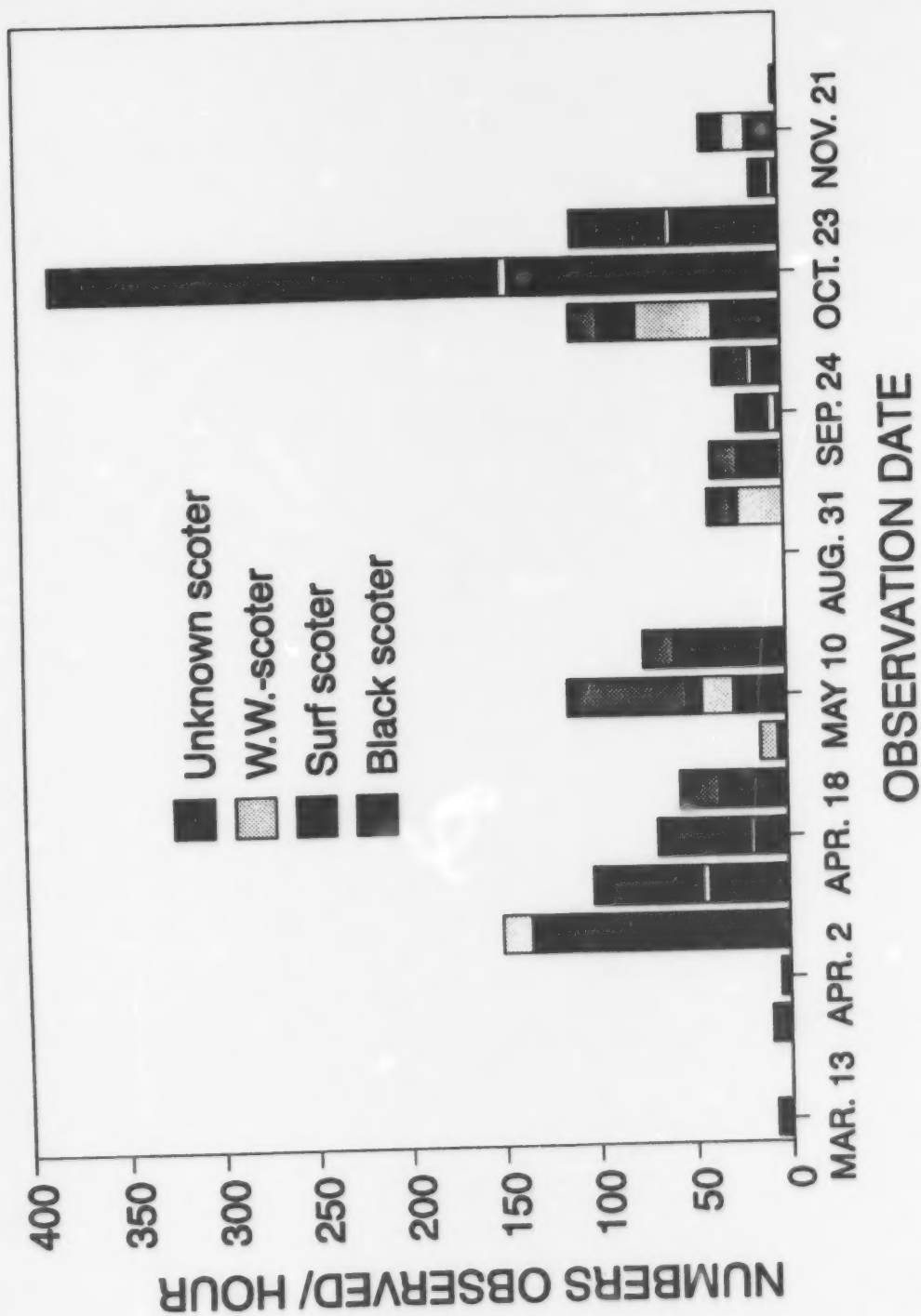


Figure 12. Scoters identified by species in the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

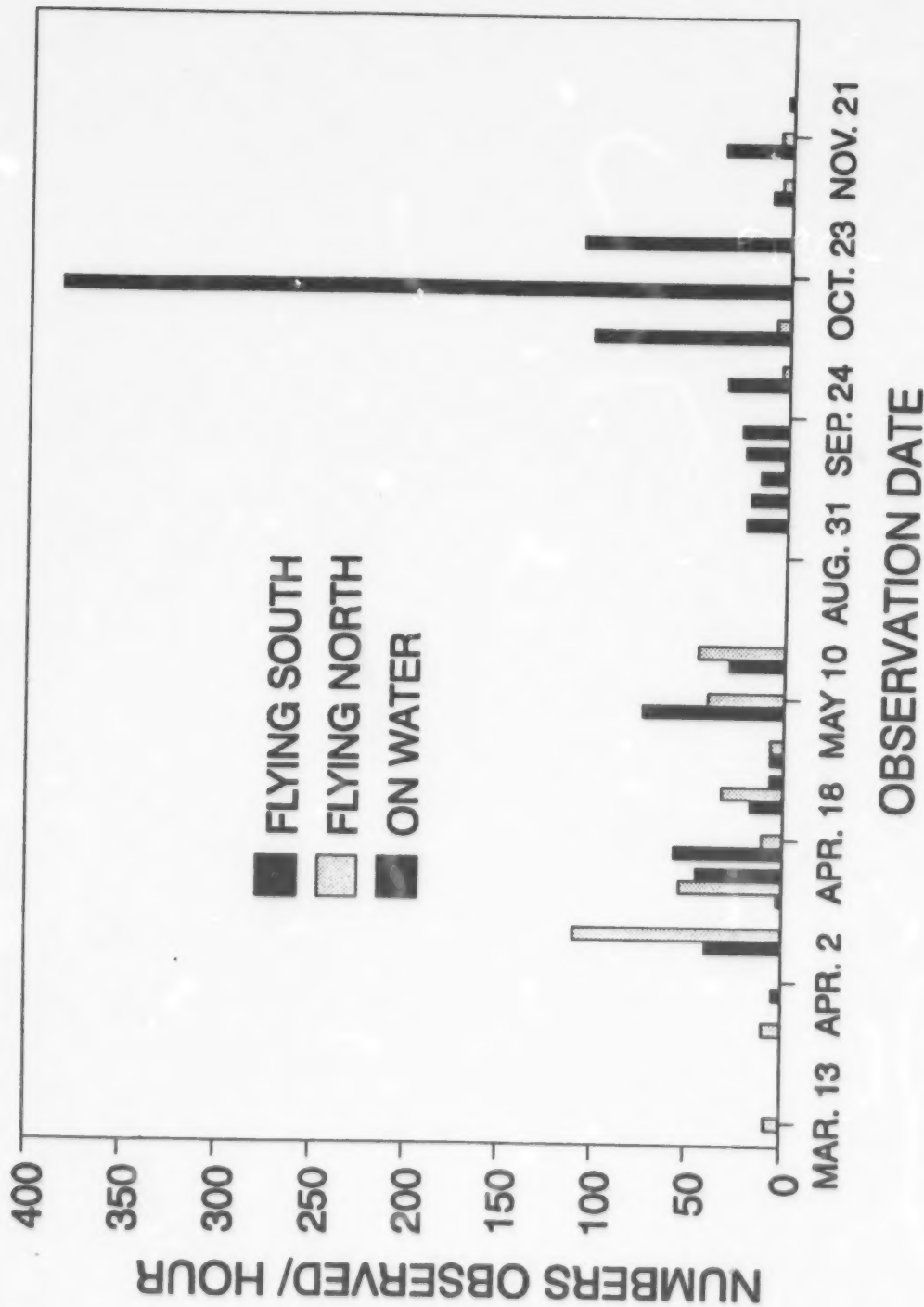


Figure 13. Scoter (all spp.) movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

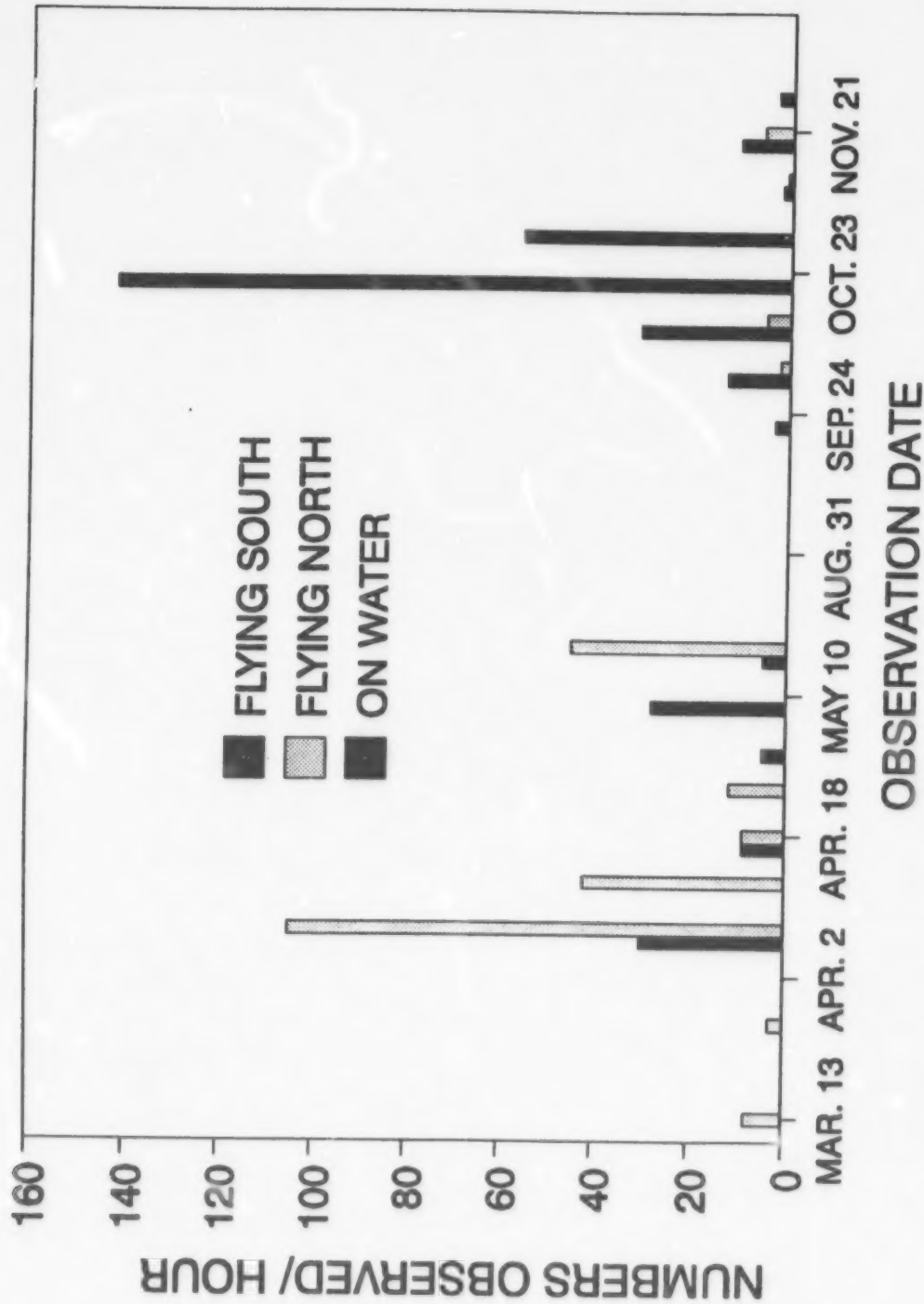


Figure 14. Scoter (unknown spp.) movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

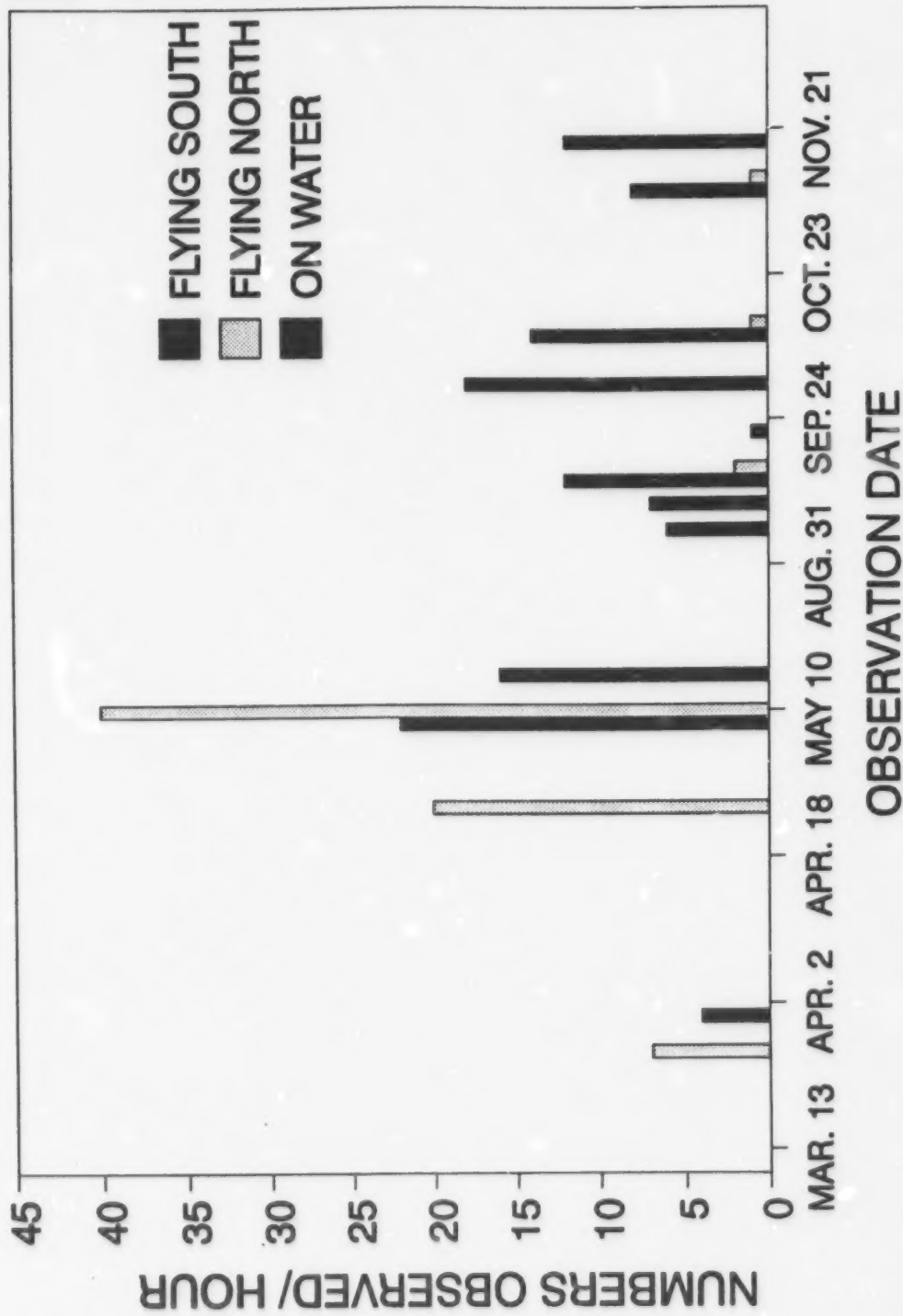


Figure 15. Black Scoter movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

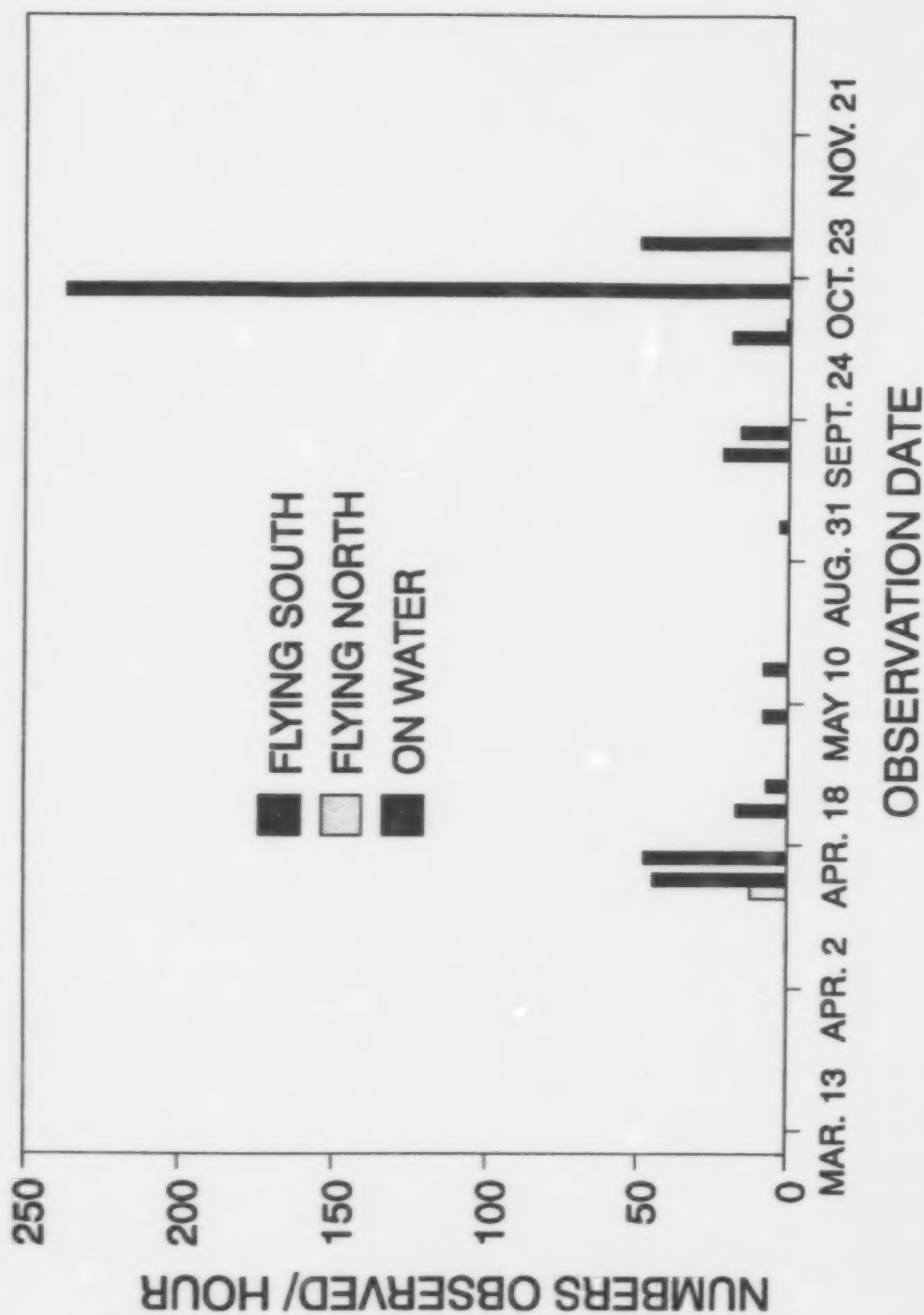


Figure 16. Surf Scoter movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

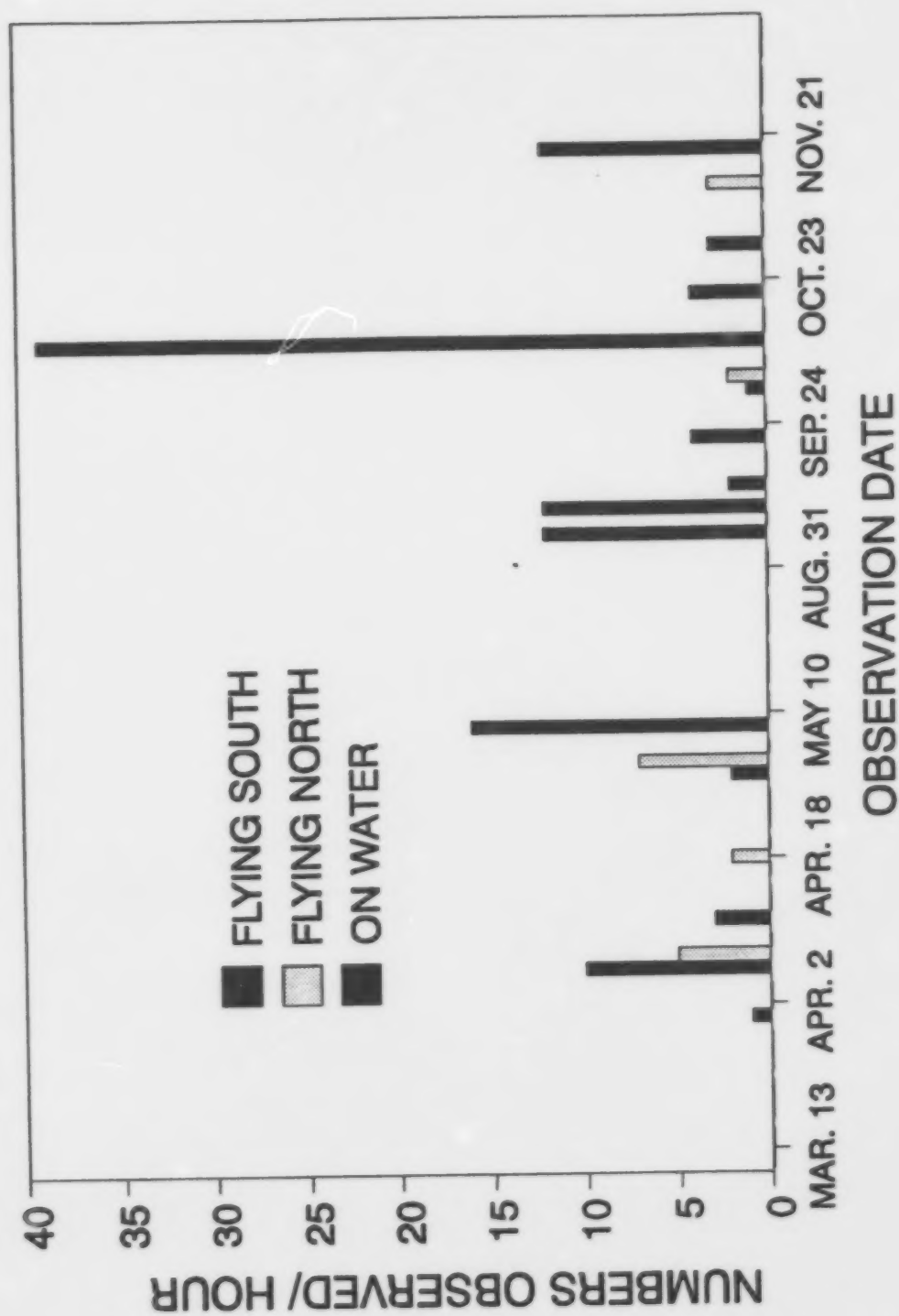


Figure 17. White-winged Scoter movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

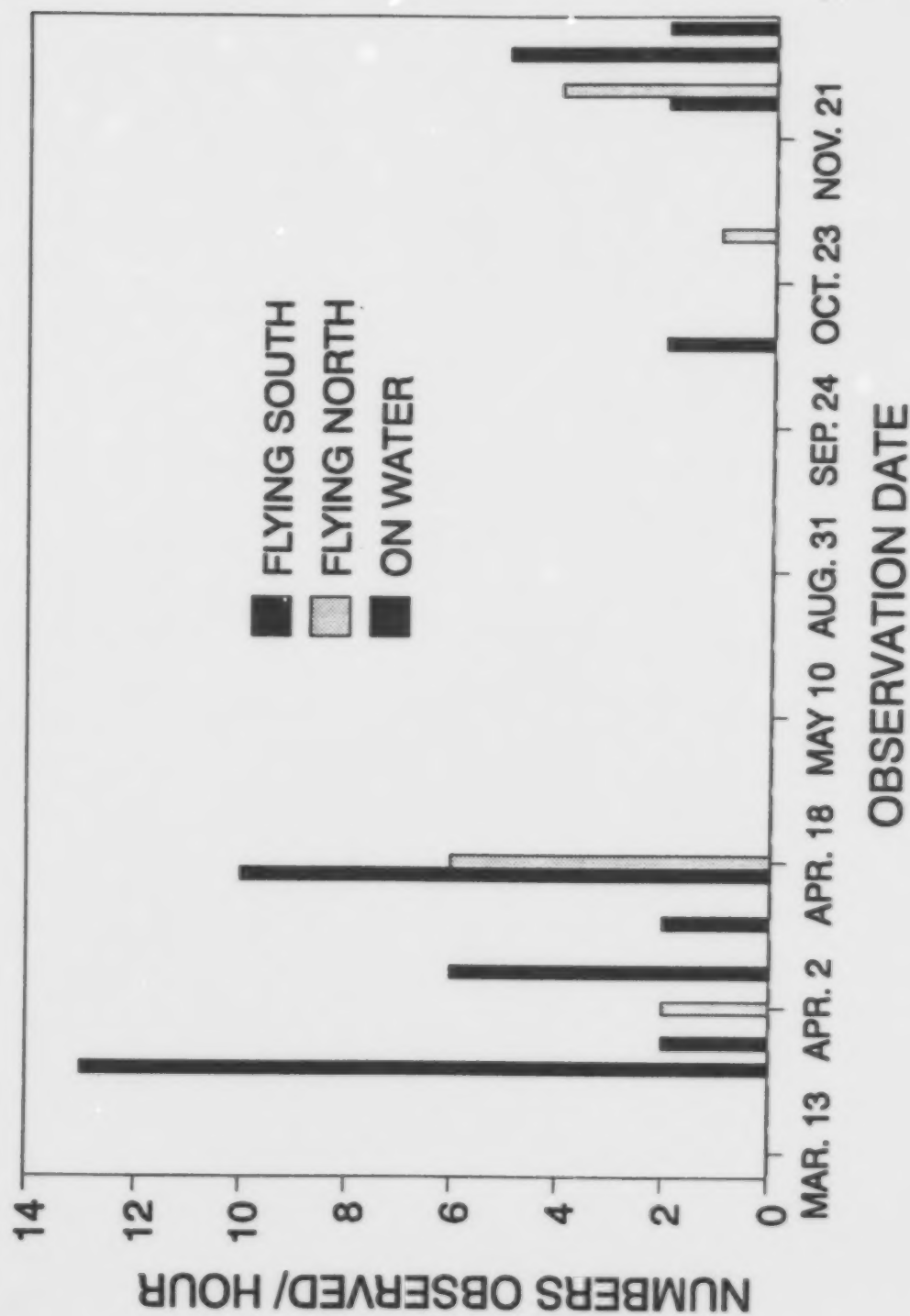


Figure 18. Common Goldeneye movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

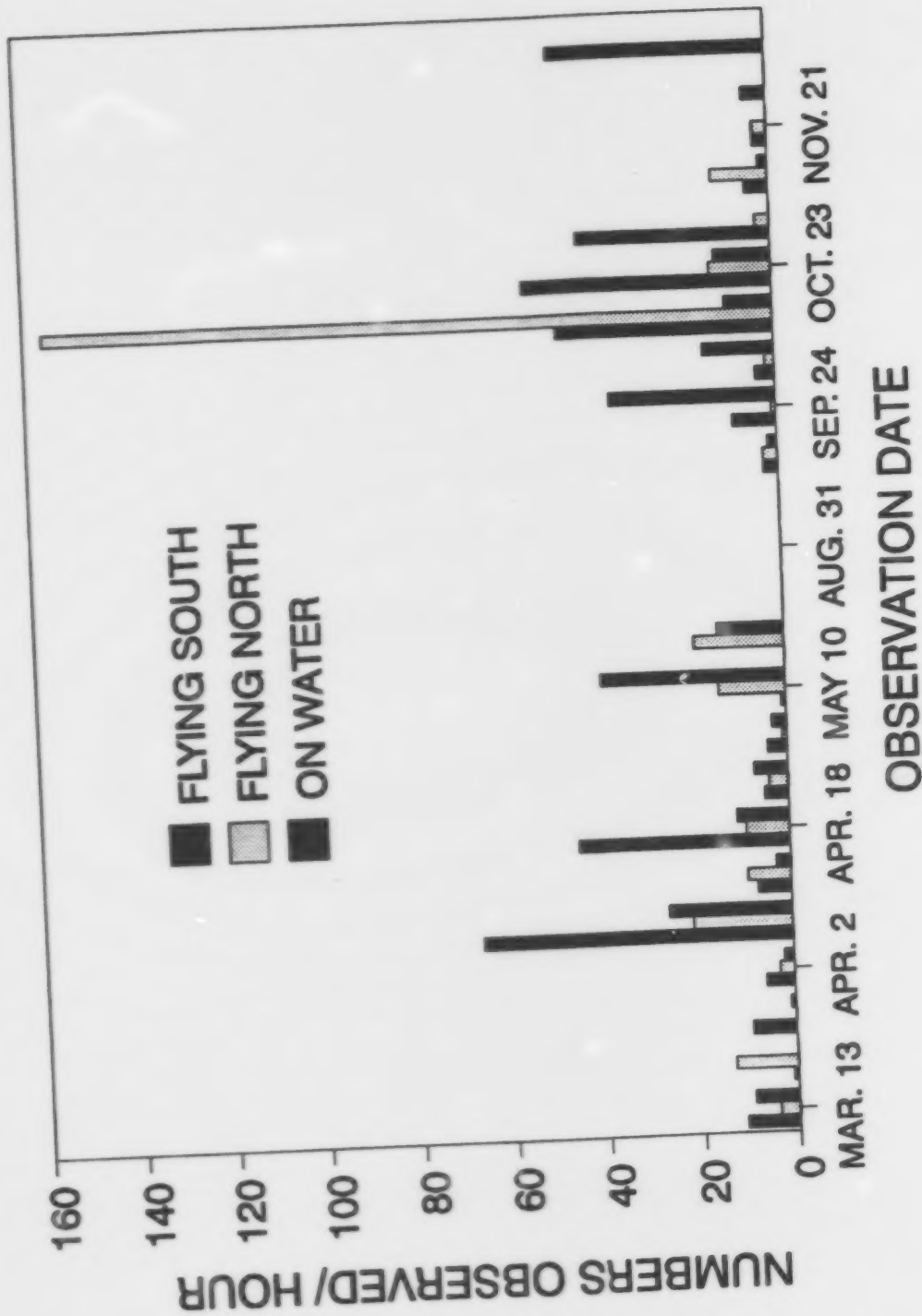


Figure 19. Red-breasted Merganser movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

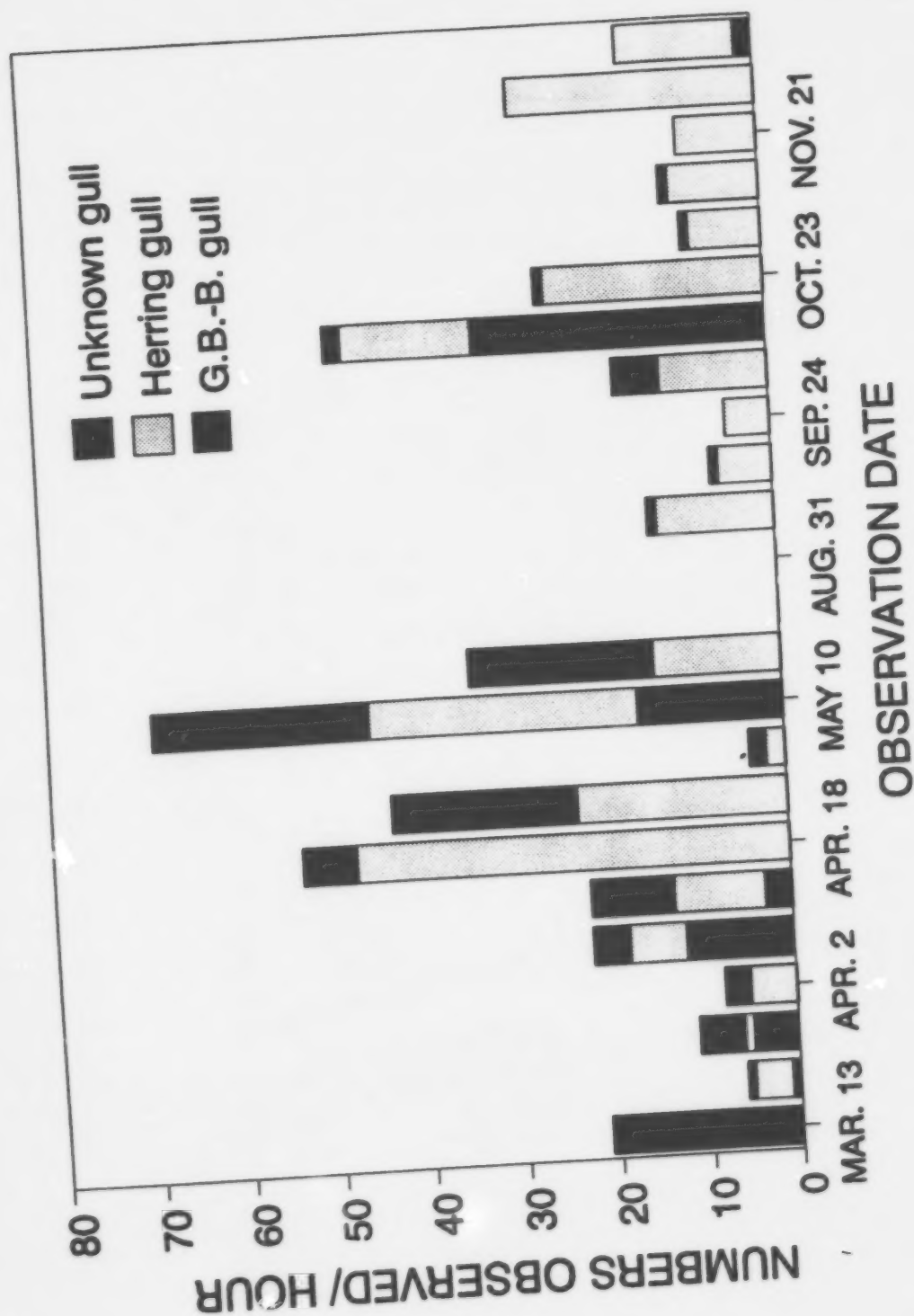


Figure 20. Gulls identified by species in the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

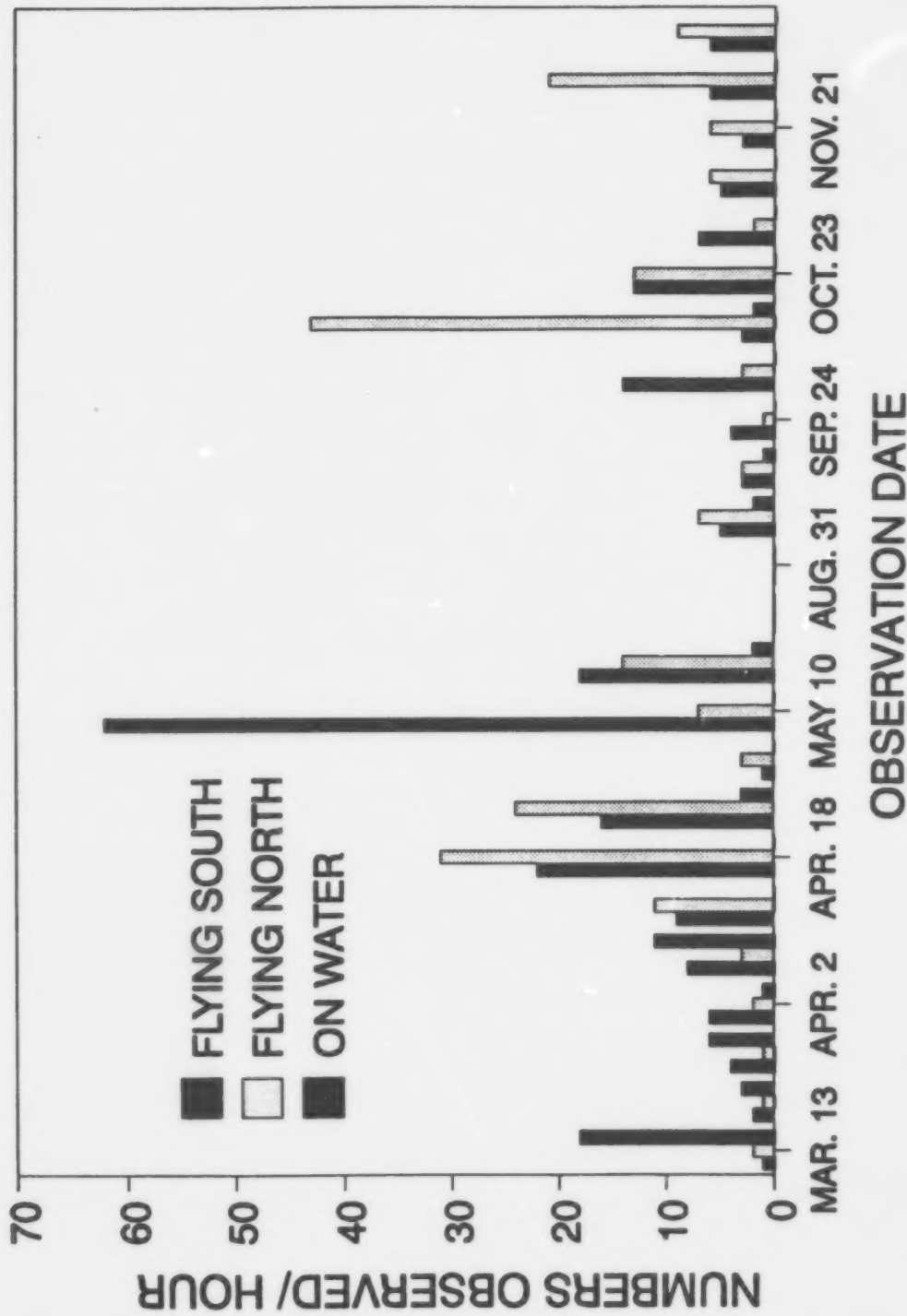


Figure 21. Gull (all spp.) movement through the Northumberland Strait, observations from Cape Jourimain NWA, March 13 - May 15 and September 7 - December 6, 1990.

Appendix 1. Raw data, seabird/seaduck in the Northumberland Strait. Observations from Cape Jourimain National Wildlife Area, March 13-May 15 and September 7-December 6, 1990. Abbreviations are listed and defined below. Direction of movement are recorded as "S"-flying southeast, "N"-flying northwest, "A"-flying to or from Prince Edward Island, and "W"-resting on water immediately in front of the cape.

AMCR - American Crow
 BLDU - American Black Duck
 BOGU - Bonaparte's Gull
 BRAN - Brant
 CAGO - Canada Goose
 COEI - Common Eider
 COGO - Common Goldeneye
 COME - Common Merganser
 COSC - Black Scoter
 DCCO - Double-crested Cormorant
 GBBG - Great Black-backed Gull
 GBHE - Great Blue Heron
 GUSP - gulls not identified to species
 HEGU - Herring Gull
 HOLA - Horned Lark
 ICLG - Iceland Gull
 LOSP - loons not identified to species
 NOGA - Northern Gannet
 NOPI - Northern Pintail
 OLDS - Oldsquaw
 REME - Red-breasted Merganser
 RNGR - Red-necked Grebe
 RTLO - Red-throated Loon
 SCAU - Scaup not identified to species
 SCSP - scoters not identified to species
 SUSC - Surf Scoter
 TESP - terns not identified to species
 TRSW - Tree Swallow
 UNDI - passerine not identified to species
 UNKN - bird not identified to species
 WWSC - White-winged Scoter

DATE	TIME	SPECIES	DIRECTION				TOTAL
			S	N	W	A	
03/13/90	930	AMCR	0	0	75	0	75
03/13/90	950	AMCR	0	0	12	0	12
03/13/90	1010	AMCR	0	0	2	0	2
03/19/90	930	AMCR	1	0	0	0	1
03/19/90	900	AMCR	0	0	9	0	9
03/26/90	910	AMCR	2	0	0	0	2
03/26/90	900	AMCR	0	0	4	0	4
04/06/90	950	AMCR	10	0	0	0	10
04/06/90	920	AMCR	1	0	0	0	1
04/06/90	910	AMCR	2	0	0	0	2
04/06/90	930	AMCR	0	2	0	0	2
04/09/90	930	AMCR	0	0	0	2	2
04/09/90	1010	AMCR	1	0	0	2	3
04/09/90	920	AMCR	0	0	0	5	5
05/03/90	755	AMCR	0	0	0	3	3
09/11/90	1120	AMCR	1	0	0	0	1
11/09/90	1025	AMCR	0	1	0	0	1
03/19/90	900	BLDU	2	0	0	0	2
03/26/90	910	BLDU	2	0	0	0	2
05/15/90	1010	BLDU	1	0	0	0	1
05/15/90	1030	BLDU	0	2	0	0	2
10/12/90	905	BLDU	0	2	0	0	2
10/23/90	1000	BOGU	0	1	0	0	1
04/06/90	1000	BRAN	7	0	0	0	7
04/06/90	940	CAGO	5	0	0	0	5
04/06/90	920	CAGO	0	0	0	24	24
04/09/90	930	CAGO	0	17	0	0	17
04/09/90	920	CAGO	0	0	0	35	35
04/09/90	1010	CAGO	0	0	0	18	18
10/30/90	910	CAGO	0	39	0	0	39
10/30/90	930	CAGO	0	76	0	0	76
03/19/90	930	COEI	0	3	0	0	3
04/09/90	1000	COEI	0	2	0	0	2
04/22/90	645	COEI	0	0	2	0	2
04/22/90	725	COEI	0	0	5	0	5
04/22/90	655	COEI	0	2	0	0	2
05/03/90	755	COEI	0	13	0	0	13
05/03/90	745	COEI	2	0	0	0	2
05/03/90	825	COEI	21	0	0	0	21
09/07/90	1015	COEI	0	0	65	0	65
09/07/90	945	COEI	0	0	1	0	1
09/07/90	925	COEI	0	0	8	0	8
09/11/90	1040	COEI	0	1	0	0	1
09/11/90	1030	COEI	0	0	28	0	28
09/24/90	1345	COEI	0	0	4	0	4
09/24/90	1435	COEI	0	0	90	0	90
10/12/90	945	COEI	13	0	110	0	123
10/12/90	935	COEI	1	0	0	0	1
10/12/90	905	COEI	0	0	2	0	2
10/12/90	855	COEI	0	0	4	0	4
10/17/90	920	COEI	8	1	0	0	9
10/17/90	1000	COEI	0	0	26	0	26
10/17/90	930	COEI	0	2	1	0	3
10/17/90	910	COEI	0	1	2	0	3
10/23/90	930	COEI	0	0	6	0	6
10/23/90	940	COEI	7	0	0	0	7
10/23/90	1000	COEI	2	0	13	0	15
10/23/90	950	COEI	11	0	0	0	11
10/30/90	910	COEI	0	1	0	0	1
10/30/90	930	COEI	8	0	0	0	8
11/09/90	1005	COEI	100	0	0	0	100

DATE	TIME	SPECIES	DIRECTION				TOTAL
			S	N	W	A	
11/09/90	945	COEI	15	0	0	0	15
11/09/90	1025	COEI	0	1	0	0	1
11/21/90	1010	COEI	15	1	0	0	16
11/21/90	1000	COEI	3	0	0	0	3
11/21/90	940	COEI	0	0	20	0	20
11/21/90	930	COEI	11	0	0	0	11
11/27/90	920	COEI	3	1	0	0	4
11/27/90	900	COEI	1	0	0	0	1
11/27/90	950	COEI	4	0	0	0	4
03/26/90	900	COGO	3	0	0	0	3
03/26/90	920	COGO	1	0	0	0	1
03/26/90	910	COGO	0	0	2	0	2
03/26/90	930	COGO	9	0	0	0	9
04/02/90	905	COGO	0	2	0	0	2
04/06/90	930	COGO	3	0	0	0	3
04/06/90	920	COGO	3	0	0	0	3
04/09/90	940	COGO	1	0	0	0	1
04/09/90	950	COGO	1	0	0	0	1
04/18/90	840	COGO	7	0	0	0	7
04/18/90	830	COGO	2	0	0	0	2
04/18/90	850	COGO	0	2	0	0	2
04/18/90	910	COGO	1	4	0	0	5
10/17/90	920	COGO	2	0	0	0	2
10/30/90	920	COGO	0	1	0	0	1
11/27/90	930	COGO	0	2	0	0	2
11/27/90	940	COGO	2	0	0	0	2
11/27/90	900	COGO	0	2	0	0	2
12/06/90	940	COGO	5	0	0	0	5
04/18/90	910	COME	4	3	0	0	7
10/30/90	900	COME	1	0	0	0	1
03/26/90	940	COSC	0	7	0	0	7
04/02/90	935	COSC	4	0	0	0	4
04/22/90	735	COSC	0	20	0	0	20
05/10/90	910	COSC	2	0	0	0	2
05/10/90	900	COSC	5	0	0	0	5
05/10/90	830	COSC	5	10	0	0	15
05/10/90	840	COSC	10	30	0	0	40
05/15/90	1050	COSC	16	0	0	0	16
09/07/90	1015	COSC	6	0	0	4	6
09/07/90	1005	COSC	0	0	7	0	7
09/11/90	1120	COSC	0	2	0	0	2
09/11/90	1030	COSC	12	0	0	0	12
09/24/90	1405	COSC	1	0	0	0	1
10/12/90	925	COSC	18	0	0	0	18
10/17/90	920	COSC	14	0	0	0	14
10/17/90	940	COSC	0	1	0	0	1
11/09/90	1005	COSC	0	1	0	0	1
11/09/90	1025	COSC	8	0	0	0	8
11/21/90	1000	COSC	10	0	0	0	10
11/21/90	950	COSC	2	0	0	0	2
05/03/90	745	DCCO	0	1	0	0	1
05/03/90	735	DCCO	0	2	0	0	2
05/03/90	825	DCCO	5	0	0	0	5
05/10/90	850	DCCO	1	0	0	0	1
05/15/90	1000	DCCO	1	0	0	0	1
09/07/90	1015	DCCO	0	1	0	0	1
09/07/90	925	DCCO	0	4	0	0	4
09/11/90	1050	DCCO	8	12	0	0	20
09/11/90	1100	DCCO	0	36	0	0	36
09/11/90	1030	DCCO	0	25	35	0	60
09/11/90	1040	DCCO	2	6	0	0	8

DATE	TIME	SPECIES	DIRECTION				TOTAL
			S	N	W	A	
09/11/90	1110	DCCO	3	27	0	0	30
09/11/90	1120	DCCO	5	7	0	0	12
09/24/90	1425	DCCO	0	2	0	0	2
09/24/90	1415	DCCO	1	0	0	0	1
09/24/90	1435	DCCO	7	0	80	0	87
10/12/90	855	DCCO	0	0	2	0	2
10/12/90	945	DCCO	3	2	16	0	21
10/12/90	935	DCCO	1	0	0	0	1
10/23/90	1000	DCCO	20	0	0	0	20
10/23/90	920	DCCO	4	0	0	0	4
10/30/90	950	DCCO	1	0	0	0	1
10/30/90	930	DCCO	1	0	0	0	1
03/13/90	1020	GBBG	0	1	0	0	1
03/13/90	950	GBBG	1	0	0	0	1
03/13/90	1000	GBBG	0	1	0	0	1
03/19/90	920	GBBG	1	0	0	0	1
03/26/90	940	GBBG	2	0	0	0	2
03/26/90	910	GBBG	0	0	1	0	1
03/26/90	930	GBBG	1	0	0	0	1
03/26/90	920	GBBG	1	0	0	0	1
04/02/90	855	GBBG	0	1	0	0	1
04/02/90	905	GBBG	2	0	0	0	2
04/06/90	950	GBBG	2	1	0	0	3
04/06/90	930	GBBG	1	0	0	0	1
04/09/90	940	GBBG	0	1	0	0	1
04/09/90	920	GBBG	2	1	0	2	5
04/09/90	930	GBBG	1	2	0	0	3
04/18/90	850	GBBG	2	0	0	0	2
04/18/90	900	GBBG	0	2	0	0	2
04/18/90	830	GBBG	0	2	0	0	2
04/22/90	725	GBBG	0	1	0	0	1
04/22/90	715	GBBG	1	6	0	0	7
04/22/90	705	GBBG	0	3	0	0	3
04/22/90	645	GBBG	2	0	1	0	3
04/22/90	735	GBBG	0	6	0	0	6
05/03/90	805	GBBG	1	0	0	0	1
05/03/90	815	GBBG	0	1	0	0	1
05/10/90	850	GBBG	4	0	0	0	4
05/10/90	900	GBBG	7	0	0	0	7
05/10/90	840	GBBG	1	1	0	0	2
05/10/90	920	GBBG	1	0	0	0	1
05/10/90	830	GBBG	10	0	0	0	10
05/15/90	1020	GBBG	0	1	0	0	1
05/15/90	1040	GBBG	0	2	0	0	2
05/15/90	1050	GBBG	3	1	0	0	4
05/15/90	1010	GBBG	6	1	0	0	7
05/15/90	1030	GBBG	0	3	2	0	5
05/15/90	1000	GBBG	1	0	0	0	1
09/07/90	925	GBBG	0	1	0	0	1
09/11/90	1100	GBBG	0	1	0	0	1
10/12/90	905	GBBG	1	0	0	0	1
10/12/90	925	GBBG	1	0	0	0	1
10/12/90	935	GBBG	0	2	0	0	2
10/12/90	945	GBBG	1	0	0	0	1
10/17/90	910	GBBG	1	0	1	0	2
10/23/90	930	GBBG	1	0	0	0	1
10/30/90	950	GBBG	1	0	0	0	1
11/09/90	1005	GBBG	0	1	0	0	1
09/07/90	935	GBHE	1	0	0	0	1
03/13/90	930	GUSP	0	0	18	0	18
03/19/90	930	GUSP	0	1	0	0	1

DATE	TIME	SPECIES	DIRECTION				TOTAL
			S	N	W	A	
03/26/90	910	GUSP	0	1	4	0	5
04/06/90	910	GUSP	0	0	9	0	9
04/06/90	930	GUSP	3	0	0	0	3
04/09/90	950	GUSP	0	3	0	0	3
05/10/90	910	GUSP	0	2	0	0	2
05/10/90	850	GUSP	3	0	0	0	3
05/10/90	920	GUSP	2	0	0	0	2
05/10/90	830	GUSP	6	0	0	0	6
05/10/90	840	GUSP	1	0	0	0	1
05/10/90	900	GUSP	2	0	0	0	2
10/17/90	950	GUSP	0	6	0	0	6
10/17/90	930	GUSP	0	26	0	0	26
12/06/90	940	GUSP	0	2	0	0	2
03/19/90	920	HEGU	1	0	0	0	1
03/19/90	900	HEGU	0	0	3	0	3
03/26/90	900	HEGU	0	0	1	0	1
04/02/90	945	HEGU	1	0	0	0	1
04/02/90	915	HEGU	2	0	0	0	2
04/02/90	935	HEGU	0	1	0	0	1
04/02/90	905	HEGU	0	0	1	0	1
04/06/90	950	HEGU	0	2	0	0	2
04/06/90	920	HEGU	1	0	0	0	1
04/06/90	910	HEGU	1	0	2	0	3
04/09/90	1010	HEGU	3	0	0	0	3
04/09/90	1000	HEGU	0	1	0	0	1
04/09/90	950	HEGU	0	1	0	0	1
04/09/90	940	HEGU	3	1	0	0	4
04/09/90	930	HEGU	0	1	0	0	1
04/18/90	850	HEGU	1	1	0	0	2
04/18/90	920	HEGU	0	2	0	0	2
04/18/90	900	HEGU	1	21	0	0	22
04/18/90	830	HEGU	16	2	0	0	18
04/18/90	840	HEGU	2	0	0	0	2
04/18/90	910	HEGU	0	1	0	0	1
04/22/90	715	HEGU	1	2	0	0	3
04/22/90	705	HEGU	3	4	0	0	7
04/22/90	735	HEGU	1	1	0	0	2
04/22/90	655	HEGU	4	1	0	0	5
04/22/90	725	HEGU	2	0	0	0	2
04/22/90	645	HEGU	2	0	2	0	4
05/03/90	745	HEGU	0	1	0	0	1
05/03/90	755	HEGU	0	1	0	0	1
05/10/90	840	HEGU	1	0	0	0	1
05/10/90	850	HEGU	2	1	0	0	3
05/10/90	910	HEGU	12	0	0	0	12
05/10/90	920	HEGU	0	1	0	0	1
05/10/90	900	HEGU	7	1	0	0	8
05/10/90	830	HEGU	3	1	0	0	4
05/15/90	1050	HEGU	2	1	0	0	3
05/15/90	1000	HEGU	3	1	0	0	4
05/15/90	1030	HEGU	3	3	0	0	6
05/15/90	1040	HEGU	0	1	0	0	1
09/07/90	945	HEGU	0	4	0	0	4
09/07/90	955	HEGU	5	1	0	0	6
09/07/90	1015	HEGU	0	1	2	0	3
09/11/90	1050	HEGU	1	1	0	0	2
09/11/90	1110	HEGU	1	0	0	0	1
09/11/90	1040	HEGU	1	1	0	0	2
09/11/90	1100	HEGU	0	0	1	0	1
09/24/90	1355	HEGU	4	0	0	0	4
09/24/90	1415	HEGU	0	1	0	0	1

DATE	TIME	SPECIES	DIRECTION				TOTAL
			S	N	W	A	
10/12/90	915	HEGU	1	0	0	0	1
10/12/90	905	HEGU	2	0	0	0	2
10/12/90	945	HEGU	7	0	0	0	7
10/12/90	935	HEGU	1	1	0	0	2
10/17/90	910	HEGU	2	0	1	0	3
10/17/90	930	HEGU	0	1	0	0	1
10/17/90	1000	HEGU	0	1	0	0	1
10/17/90	940	HEGU	0	5	0	0	5
10/17/90	950	HEGU	0	4	0	0	4
10/23/90	940	HEGU	0	2	0	0	2
10/23/90	920	HEGU	1	1	0	0	2
10/23/90	950	HEGU	4	0	0	0	4
10/23/90	1000	HEGU	1	2	0	0	3
10/23/90	910	HEGU	5	1	0	0	6
10/23/90	930	HEGU	1	6	0	0	7
10/30/90	910	HEGU	1	1	0	0	2
10/30/90	930	HEGU	0	1	0	0	1
10/30/90	920	HEGU	1	0	0	0	1
10/30/90	940	HEGU	3	0	0	0	3
10/30/90	950	HEGU	1	0	0	0	1
11/09/90	1035	HEGU	3	1	0	0	4
11/09/90	1025	HEGU	1	2	0	0	3
11/09/90	1005	HEGU	1	1	0	0	2
11/09/90	955	HEGU	0	1	0	0	1
11/21/90	1000	HEGU	0	3	0	0	3
11/21/90	940	HEGU	1	0	0	0	1
11/21/90	1010	HEGU	1	1	0	0	2
11/21/90	930	HEGU	1	2	0	0	3
11/27/90	910	HEGU	0	5	0	0	5
11/27/90	940	HEGU	1	4	0	0	5
11/27/90	900	HEGU	1	0	0	0	1
11/27/90	920	HEGU	2	3	0	0	5
11/27/90	950	HEGU	1	7	0	0	8
11/27/90	930	HEGU	1	2	0	0	3
12/06/90	940	HEGU	1	0	0	0	1
12/06/90	910	HEGU	2	2	0	0	4
12/06/90	950	HEGU	1	2	0	0	3
12/06/90	930	HEGU	1	1	0	0	2
12/06/90	920	HEGU	0	1	0	0	1
12/06/90	1000	HEGU	1	1	0	0	2
11/09/90	1035	HOLA	0	150	0	0	150
04/02/90	915	ICLG	1	0	0	0	1
04/09/90	940	LOSP	0	1	0	0	1
05/15/90	1040	LOSP	0	0	4	0	4
05/15/90	1000	LOSP	0	2	0	0	2
05/15/90	1030	LOSP	0	1	1	0	2
05/15/90	1050	LOSP	1	0	0	0	1
09/07/90	1015	LOSP	1	0	0	0	1
09/07/90	1005	LOSP	1	0	0	0	1
09/07/90	945	LOSP	2	0	0	0	2
09/11/90	1120	LOSP	4	0	0	0	4
09/11/90	1100	LOSP	1	0	0	0	1
09/11/90	1040	LOSP	3	1	0	0	4
09/11/90	1050	LOSP	1	0	0	0	1
10/23/90	1000	LOSP	3	0	0	0	3
10/23/90	930	LOSP	1	1	0	0	2
10/30/90	900	LOSP	5	0	0	0	5
10/30/90	940	LOSP	59	0	0	0	59
10/30/90	920	LOSP	29	1	0	0	30
10/30/90	950	LOSP	54	0	2	0	56
10/30/90	930	LOSP	9	0	0	0	9

DATE	TIME	SPECIES	DIRECTION				TOTAL
			S	N	W	A	
10/30/90	910	LOSP	39	0	0	0	39
11/21/90	1020	LOSP	0	1	0	0	1
11/21/90	1000	LOSP	0	1	0	0	1
11/21/90	950	LOSP	1	0	0	0	1
11/21/90	940	LOSP	1	0	1	0	2
11/27/90	920	LOSP	1	0	0	0	1
11/27/90	930	LOSP	4	0	0	0	4
11/27/90	910	LOSP	1	0	0	0	1
04/06/90	940	NOGA	1	0	0	0	1
04/09/90	920	NOGA	0	2	0	0	2
04/18/90	840	NOGA	4	0	0	0	4
04/18/90	910	NOGA	36	0	0	0	36
04/18/90	830	NOGA	4	0	0	0	4
04/18/90	850	NOGA	5	0	2	0	7
04/18/90	900	NOGA	6	0	0	0	6
05/03/90	745	NOGA	0	1	0	0	1
05/15/90	1010	NOGA	4	0	0	0	4
05/15/90	1050	NOGA	0	1	0	0	1
05/15/90	1040	NOGA	3	0	0	0	3
09/24/90	1425	NOGA	1	0	0	0	1
09/24/90	1345	NOGA	2	0	0	0	2
09/24/90	1415	NOGA	1	1	0	0	2
10/12/90	855	NOGA	0	0	1	0	1
10/12/90	935	NOGA	1	0	0	0	1
10/12/90	925	NOGA	6	1	0	0	7
10/12/90	915	NOGA	3	1	0	0	4
10/12/90	905	NOGA	4	0	0	0	4
10/12/90	945	NOGA	3	0	0	0	3
10/17/90	910	NOGA	1	3	0	0	4
10/17/90	950	NOGA	0	3	0	0	3
10/17/90	940	NOGA	0	1	0	0	1
10/17/90	1000	NOGA	2	0	0	0	2
10/17/90	930	NOGA	1	1	0	0	2
10/17/90	920	NOGA	1	2	0	0	3
10/23/90	940	NOGA	1	1	0	0	2
10/23/90	950	NOGA	1	0	0	0	1
10/23/90	910	NOGA	0	2	0	0	2
10/30/90	920	NOGA	1	0	0	0	1
10/30/90	950	NOGA	9	0	0	0	9
10/30/90	940	NOGA	14	0	0	0	14
10/30/90	930	NOGA	6	0	0	0	6
10/30/90	910	NOGA	11	0	0	0	11
10/30/90	900	NOGA	20	1	0	0	21
11/09/90	945	NOGA	1	1	0	0	2
11/21/90	1000	NOGA	0	2	0	0	2
11/21/90	1020	NOGA	0	0	1	0	1
11/27/90	910	NOGA	0	0	2	0	2
09/24/90	1415	NOPI	0	1	0	0	1
03/26/90	850	OLDS	0	0	8	0	8
03/26/90	900	OLDS	0	1	0	0	1
03/26/90	930	OLDS	1	0	0	0	1
04/02/90	925	OLDS	1	0	0	0	1
04/02/90	935	OLDS	0	0	1	0	1
04/02/90	905	OLDS	6	0	2	0	8
04/06/90	920	OLDS	0	1	0	0	1
04/06/90	950	OLDS	2	0	0	0	2
04/09/90	1010	OLDS	1	1	0	0	2
04/09/90	1000	OLDS	1	2	1	0	4
04/09/90	950	OLDS	0	1	0	0	1
04/09/90	930	OLDS	1	0	1	0	2
04/09/90	920	OLDS	0	0	3	0	3

DATE	TIME	SPECIES	DIRECTION				TOTAL
			S	N	W	A	
04/09/90	940	OLDS	0	0	4	0	4
04/18/90	900	OLDS	0	2	0	0	2
04/18/90	830	OLDS	0	0	6	0	6
04/18/90	850	OLDS	0	5	0	0	5
04/22/90	735	OLDS	0	2	0	0	2
04/22/90	655	OLDS	0	2	0	0	2
04/22/90	645	OLDS	0	0	4	0	4
04/22/90	705	OLDS	0	1	0	0	1
05/10/90	850	OLDS	0	1	0	0	1
05/10/90	830	OLDS	0	2	0	0	2
09/07/90	945	OLDS	0	2	0	0	2
10/12/90	925	OLDS	2	0	0	0	2
10/12/90	905	OLDS	2	0	0	0	2
10/17/90	920	OLDS	12	0	0	0	12
10/23/90	1000	OLDS	0	1	0	0	1
10/30/90	940	OLDS	16	0	0	0	16
10/30/90	950	OLDS	8	2	0	0	10
10/30/90	930	OLDS	1	1	0	0	2
10/30/90	900	OLDS	11	0	0	0	11
10/30/90	920	OLDS	4	8	0	0	12
11/09/90	945	OLDS	0	3	2	0	5
11/09/90	1025	OLDS	0	1	0	0	1
11/09/90	1035	OLDS	2	1	0	0	3
11/09/90	1005	OLDS	1	3	0	0	4
11/21/90	1010	OLDS	8	1	1	0	10
11/21/90	930	OLDS	0	1	0	0	1
11/21/90	1020	OLDS	1	0	0	0	1
11/21/90	940	OLDS	2	1	1	0	4
11/21/90	950	OLDS	4	2	13	0	19
11/21/90	1000	OLDS	2	0	3	0	5
11/27/90	950	OLDS	6	9	0	0	15
11/27/90	940	OLDS	0	0	1	0	1
11/27/90	920	OLDS	5	4	0	0	9
11/27/90	930	OLDS	3	4	5	0	12
11/27/90	910	OLDS	0	0	2	0	2
11/27/90	900	OLDS	11	0	2	0	13
12/06/90	910	OLDS	2	0	1	0	3
12/06/90	940	OLDS	0	1	0	0	1
12/06/90	930	OLDS	4	0	0	0	4
03/13/90	1000	REME	1	0	0	0	1
03/13/90	930	REME	4	0	9	0	13
03/13/90	1010	REME	5	0	0	0	5
03/13/90	940	REME	1	4	0	0	5
03/19/90	940	REME	0	1	0	0	1
03/19/90	950	REME	1	0	0	0	1
03/19/90	920	REME	0	9	0	0	9
03/19/90	910	REME	0	1	0	0	1
03/19/90	900	REME	0	2	0	0	2
03/26/90	930	REME	5	0	0	0	5
03/26/90	910	REME	1	0	1	0	2
03/26/90	940	REME	3	0	0	0	3
04/02/90	925	REME	3	0	0	0	3
04/02/90	855	REME	0	2	0	0	2
04/02/90	935	REME	2	1	0	0	3
04/02/90	915	REME	1	0	0	0	1
04/02/90	905	REME	0	0	2	0	2
04/06/90	940	REME	6	7	14	0	27
04/06/90	910	REME	14	11	0	0	25
04/06/90	1000	REME	17	3	8	0	28
04/06/90	950	REME	0	0	3	0	3
04/06/90	920	REME	27	0	0	0	27

DATE	TIME	SPECIES	DIRECTION				TOTAL
			S	N	W	A	
04/06/90	930	REME	2	0	1	0	3
04/09/90	1000	REME	1	2	3	0	6
04/09/90	1010	REME	1	0	0	0	1
04/09/90	920	REME	0	1	0	0	1
04/09/90	940	REME	2	5	0	0	7
04/09/90	950	REME	0	0	0	1	1
04/09/90	930	REME	3	1	0	0	4
04/18/90	900	REME	1	0	0	0	1
04/18/90	910	REME	4	3	2	0	9
04/18/90	920	REME	5	0	0	0	5
04/18/90	830	REME	8	3	9	0	20
04/18/90	840	REME	18	1	0	0	19
04/18/90	850	REME	9	2	0	0	11
04/22/90	645	REME	0	0	7	0	7
04/22/90	715	REME	1	1	0	0	2
04/22/90	655	REME	2	2	0	0	4
04/22/90	705	REME	2	1	0	0	3
05/03/90	735	REME	4	0	3	0	7
05/03/90	805	REME	0	1	0	0	1
05/10/90	900	REME	1	0	9	0	10
05/10/90	920	REME	0	0	28	0	28
05/10/90	830	REME	0	2	0	0	2
05/10/90	850	REME	0	1	2	0	3
05/10/90	840	REME	0	11	0	0	11
05/15/90	1010	REME	0	4	0	0	4
05/15/90	1040	REME	0	4	0	0	4
05/15/90	1000	REME	0	1	14	0	15
05/15/90	1030	REME	0	2	0	0	2
05/15/90	1020	REME	0	8	0	0	8
09/11/90	1100	REME	3	0	2	0	5
09/11/90	1110	REME	0	3	0	0	3
09/24/90	1435	REME	0	0	35	0	35
09/24/90	1405	REME	0	1	0	0	1
09/24/90	1425	REME	9	0	0	0	9
10/12/90	945	REME	0	2	15	0	17
10/12/90	855	REME	4	0	0	0	4
10/17/90	920	REME	4	3	0	0	7
10/17/90	950	REME	17	50	0	0	67
10/17/90	930	REME	6	31	0	0	37
10/17/90	1000	REME	2	39	10	0	51
10/17/90	940	REME	11	19	0	0	30
10/17/90	910	REME	6	14	0	6	26
10/23/90	930	REME	0	2	0	0	2
10/23/90	910	REME	11	3	12	0	26
10/23/90	920	REME	15	1	0	0	16
10/23/90	940	REME	1	7	0	0	8
10/23/90	950	REME	15	0	0	0	15
10/23/90	1000	REME	11	0	0	0	11
10/30/90	920	REME	0	2	0	0	2
10/30/90	900	REME	5	0	0	0	5
10/30/90	910	REME	11	0	0	0	11
10/30/90	930	REME	21	0	0	0	21
10/30/90	950	REME	4	1	0	0	5
11/09/90	1005	REME	0	1	0	0	1
11/09/90	1025	REME	2	5	0	0	7
11/09/90	1035	REME	3	3	0	0	6
11/09/90	955	REME	0	3	0	0	3
11/09/90	945	REME	0	0	2	0	2
11/21/90	940	REME	1	0	0	0	1
11/21/90	1020	REME	0	1	0	0	1
11/21/90	950	REME	1	0	0	0	1

DATE	TIME	SPECIES	DIRECTION				TOTAL
			S	N	W	A	
11/21/90	1000	REME	1	1	0	0	2
11/21/90	930	REME	0	1	0	0	1
11/27/90	940	REME	4	0	0	0	4
11/27/90	950	REME	1	0	0	0	1
12/06/90	940	REME	3	0	0	0	3
12/06/90	920	REME	13	0	0	0	13
12/06/90	950	REME	8	0	0	0	8
12/06/90	930	REME	22	0	0	0	22
09/24/90	1435	RNGR	0	0	2	0	2
11/21/90	950	RNGR	0	0	1	0	1
09/24/90	1345	RTLO	0	0	4	0	4
09/24/90	1355	RTLO	0	0	12	0	12
09/24/90	1435	RTLO	0	0	25	0	25
10/12/90	905	RTLO	0	0	10	0	10
10/12/90	925	RTLO	0	0	12	0	12
10/12/90	945	RTLO	0	0	12	0	12
10/12/90	855	RTLO	0	0	13	0	13
10/17/90	930	RTLO	1	0	0	0	1
10/17/90	1000	RTLO	2	0	2	0	4
10/17/90	940	RTLO	0	2	1	0	3
10/17/90	910	RTLO	0	0	2	0	2
10/17/90	950	RTLO	0	1	3	0	4
10/23/90	930	RTLO	0	0	1	0	1
10/30/90	900	RTLO	0	0	1	0	1
03/26/90	940	SCAU	7	0	0	0	7
03/26/90	900	SCAU	4	0	0	0	4
04/18/90	840	SCAU	0	2	0	0	2
03/13/90	950	SCSP	0	4	0	0	4
03/13/90	1020	SCSP	0	4	0	0	4
03/26/90	920	SCSP	0	3	0	0	3
04/06/90	940	SCSP	0	12	0	0	12
04/06/90	950	SCSP	20	0	0	0	20
04/06/90	920	SCSP	10	24	0	0	34
04/06/90	1000	SCSP	0	69	0	0	69
04/09/90	1010	SCSP	0	17	0	0	17
04/09/90	920	SCSP	0	8	0	0	8
04/09/90	940	SCSP	0	1	0	0	1
04/09/90	1000	SCSP	0	16	0	0	16
04/18/90	850	SCSP	5	1	0	0	6
04/18/90	840	SCSP	0	2	0	0	2
04/18/90	900	SCSP	2	2	0	0	4
04/18/90	920	SCSP	2	4	0	0	6
04/22/90	725	SCSP	0	12	0	0	12
05/03/90	745	SCSP	3	0	0	0	3
05/03/90	755	SCSP	2	0	0	0	2
05/10/90	840	SCSP	5	0	0	0	5
05/10/90	830	SCSP	5	0	0	0	5
05/10/90	920	SCSP	16	0	0	0	16
05/10/90	850	SCSP	2	0	0	0	2
05/15/90	1020	SCSP	0	31	0	0	31
05/15/90	1030	SCSP	0	12	0	0	12
05/15/90	1040	SCSP	5	0	0	0	5
05/15/90	1010	SCSP	0	2	0	0	2
09/24/90	1425	SCSP	3	0	0	0	3
10/12/90	915	SCSP	2	0	0	0	2
10/12/90	935	SCSP	8	0	0	0	8
10/12/90	905	SCSP	3	2	0	0	5
10/17/90	910	SCSP	8	5	0	0	13
10/17/90	920	SCSP	11	0	0	0	11
10/17/90	1000	SCSP	12	0	0	0	12
10/23/90	920	SCSP	10	0	0	0	10

DATE	TIME	SPECIES	DIRECTION				TOTAL
			S	N	W	A	
10/23/90	910	SCSP	5	0	0	0	5
10/23/90	1000	SCSP	2	0	0	0	2
10/23/90	950	SCSP	120	0	0	0	120
10/23/90	940	SCSP	5	0	0	0	5
10/30/90	900	SCSP	39	0	0	0	39
10/30/90	930	SCSP	17	0	0	0	17
11/09/90	1025	SCSP	2	0	0	0	2
11/09/90	1035	SCSP	0	1	0	0	1
11/21/90	940	SCSP	4	0	0	0	4
11/21/90	1010	SCSP	7	0	0	0	7
11/21/90	1020	SCSP	0	6	0	0	6
11/27/90	920	SCSP	3	0	0	0	3
04/09/90	1010	SUSC	0	12	0	0	12
04/09/90	920	SUSC	0	0	45	0	45
04/18/90	920	SUSC	40	0	0	0	40
04/18/90	850	SUSC	8	0	0	0	8
04/22/90	645	SUSC	17	0	7	0	24
05/10/90	910	SUSC	4	0	0	0	4
05/10/90	850	SUSC	4	0	0	0	4
05/15/90	1040	SUSC	8	0	0	0	8
09/07/90	1005	SUSC	3	0	0	0	3
09/11/90	1100	SUSC	0	0	22	0	22
09/24/90	1435	SUSC	16	0	0	0	16
10/17/90	930	SUSC	4	1	0	0	5
10/17/90	920	SUSC	15	0	0	0	15
10/23/90	920	SUSC	12	0	0	0	12
10/23/90	950	SUSC	225	0	0	0	225
10/30/90	930	SUSC	50	0	0	0	50
09/07/90	935	TESP	29	1	0	0	30
09/07/90	945	TESP	4	3	0	0	7
09/07/90	1005	TESP	0	35	0	0	35
09/07/90	955	TESP	0	3	0	0	3
09/07/90	1015	TESP	0	3	0	0	3
09/11/90	1100	TESP	0	3	0	0	3
09/11/90	1120	TESP	2	0	0	0	2
09/24/90	1415	TESP	1	0	0	0	1
09/24/90	1355	TESP	1	0	0	0	1
09/24/90	1405	TESP	0	4	0	0	4
09/24/90	1425	TESP	1	0	0	0	1
09/24/90	1345	TESP	4	4	0	0	8
09/24/90	1435	TESP	0	2	0	0	2
05/10/90	920	TRSW	3	0	0	0	3
05/15/90	1010	TRSW	2	0	0	0	2
05/10/90	920	UNDI	0	0	0	1	1
03/19/90	910	UNKN	0	15	0	0	15
03/26/90	920	UNKN	0	1	0	0	1
04/06/90	940	UNKN	1	0	0	0	1
04/09/90	940	UNKN	0	10	0	0	10
05/03/90	745	UNKN	0	1	0	0	1
10/30/90	930	UNKN	6	0	0	0	6
10/30/90	910	UNKN	1	0	0	0	1
11/27/90	910	UNKN	0	3	0	0	3
04/02/90	945	WWSC	1	0	0	0	1
04/06/90	930	WWSC	3	0	0	0	3
04/06/90	950	WWSC	7	0	0	0	7
04/06/90	920	WWSC	0	3	0	0	3
04/06/90	910	WWSC	0	2	0	0	2
04/09/90	1000	WWSC	3	0	0	0	3
04/18/90	830	WWSC	0	2	0	0	2
05/03/90	815	WWSC	0	4	0	0	4
05/03/90	805	WWSC	2	2	0	0	4

DATE	TIME	SPECIES	DIRECTION				TOTAL
			S	N	W	A	
05/03/90	825	WWSC	0	1	0	0	1
05/10/90	910	WWSC	6	0	0	0	6
05/10/90	840	WWSC	10	0	0	0	10
09/07/90	1005	WWSC	2	0	12	0	14
09/07/90	935	WWSC	10	0	0	0	10
09/11/90	1100	WWSC	2	0	0	0	2
09/24/90	1435	WWSC	4	0	0	0	4
10/12/90	935	WWSC	1	0	0	0	1
10/12/90	855	WWSC	0	2	0	0	2
10/17/90	940	WWSC	8	0	0	0	8
10/17/90	910	WWSC	22	0	0	0	22
10/17/90	920	WWSC	7	0	0	0	7
10/17/90	930	WWSC	1	0	0	0	1
10/17/90	1000	WWSC	1	0	0	0	1
10/23/90	920	WWSC	1	0	0	0	1
10/23/90	940	WWSC	3	0	0	0	3
10/30/90	900	WWSC	1	0	0	0	1
10/30/90	950	WWSC	2	0	0	0	2
11/09/90	1035	WWSC	0	3	0	0	3
11/21/90	1020	WWSC	4	0	0	0	4
11/21/90	930	WWSC	4	0	0	0	8